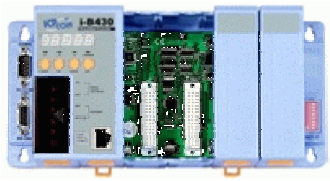
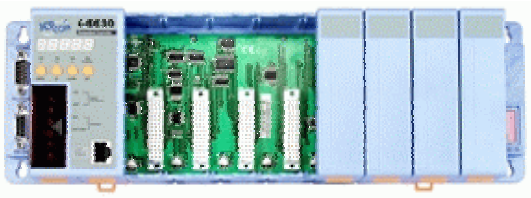
8430/8830 User's Manual

Version 1.0, December 2004





8430/8830

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, starting from the date of delivery to the original purchaser.

Warning

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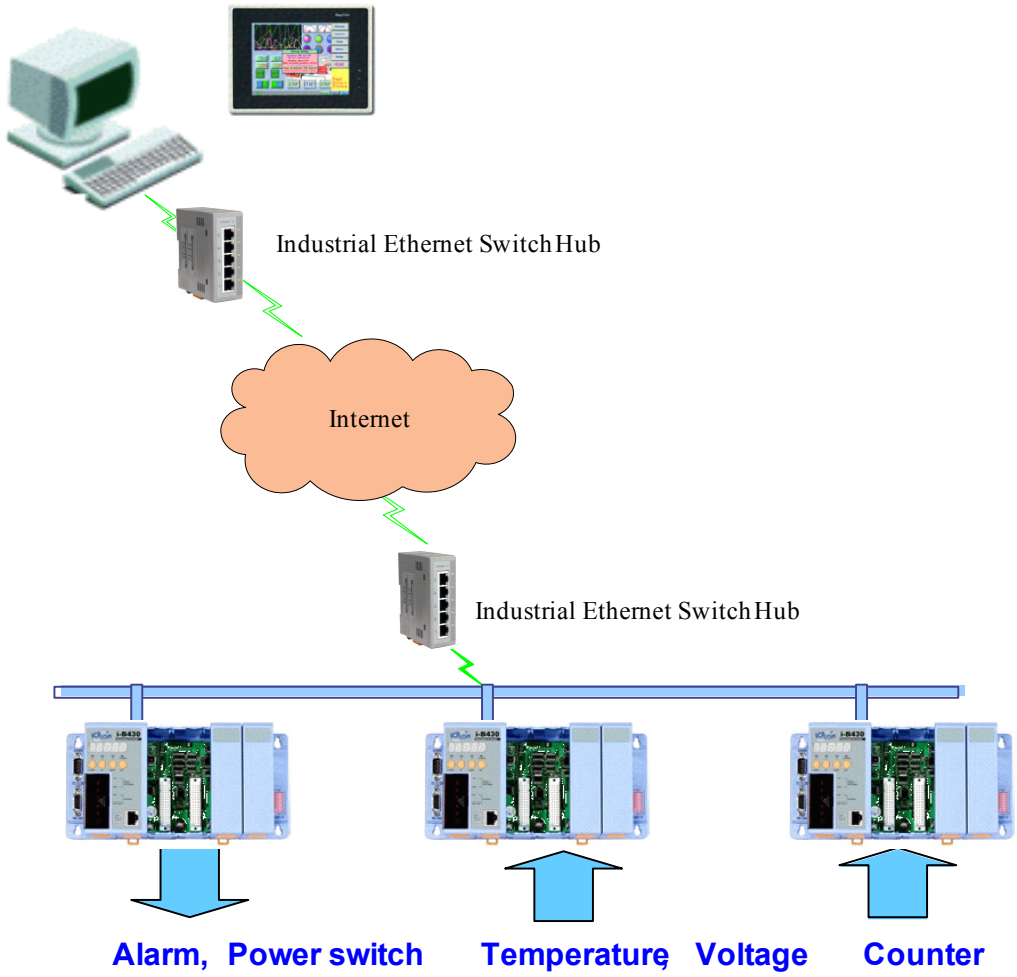
Chapter 1. Introduction

The i-8430 and i-8830 are Ethernet I/O units using DCON Protocol Firmware E10M_nnn.exe (*1). ICPDAS provides various I/O modules(*2) ,using such as analog input/output and digital input/output and counter modules which can be used in remote data acquisition and control application for environment monitoring, power management, factory automation, etc . via Ethernet communication.



(*1): For detail of E10M_nnn.exe, please refer to

CD:\Napdos\DCON\8430_8830\Firmware\Version_Annn.txt

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/8430_8830/firmware/

(*2): For detail of I/O modules which can be used with 8430/8830, please refer to

CD:\Napdos\DCON\IO_Module\

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/

1.1 Features

Ethernet –based Data Acquisition I/O unit

The i-8430 and i-8830 are 10Mbps Ethernet I/O units. This feature allows Ethernet applications to access and control the remote I/O in industrial filed network. And E10M_nnn.exe or 8KE10.exe is the DCON firmware for the i-8430, i-8431, i-8830, i-8831, i-8KE4 and i-8KE8. Using this firmware, applications can be easily and directly developed using a TCP program, or via VxComm technology.

ASCII-based protocol (DCON Protocol)

The 8430/8830 control units use the DCON protocol, which is a request/reply communication protocol used with I-7000/8000/87K series I/O modules. And is used to access the data from the module using a simple ASCII format. For example, sending the command “$01M” will query the controller name. The responding module will reply with a message similar to “!018430(cr)”

For more details regarding the DCON Protocol, please refer to Appendix B: DCON protocol.
For DCON Protocol about 8000 MCU and 8000 series I/O modules. Please refer to :

CD:\Napdos\DCON\IO_Module\hw_dcon_on_8KUnit
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/hw_dcon_on_8kunit/

Various SDK provided (free)

In order to access the I/O modules that are connected to 8430/8830.
Various SDKs are provided, such as: (see Note1, Note2, Note3)

- DLL driver
- ActiveX component
- LabView bundled driver
- Indusoft bundled driver
- Linux driver
- OPC server

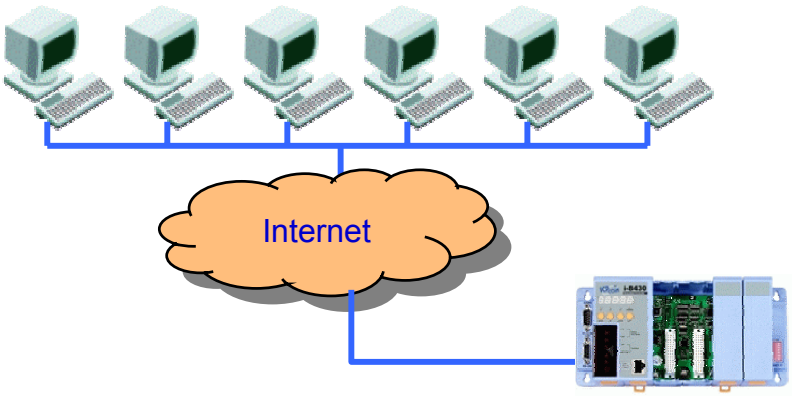
Note1: All these SDKs include the DCON Command and can be easily and quickly integrated into the user's system. Please refer to Chapter 3 for more detail information.
Note2: When applied to an Ethernet interface, users should first install VxComm utility when using these SDKs
Note3: DLL, ActiveX, LabView, IndoSoft, OPC server and VxComm utility only support the windows platform. (Windows 98, Windows NT, Windows 2000, Windows XP)

I/O configurable via the Ethernet

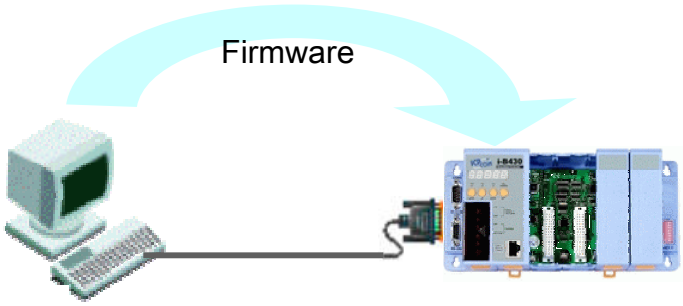
The DCON Utility is used to configure I-7000, I-8000 and I-87K series I/O modules. It originally communicated with the I/O modules via the COM port. For I/O modules on the i-8430 and i-8830, using the VxComm technique to create a virtual COM port can let DCON Utility access the I/O modules via the Ethernet. For more details, please refer to Chapter 3.

Simultaneous access by a maximum of 6 host PCs

Although a maximum of 6 host PCs are allowed simultaneous access, it is recommended that fewer host PCs are used in order to give better performance and stability.



Updateable firmware (via the RS-232 port)



Note: the 8430/8830's COM1 port can be used to download firmware, update the MiniOS image file, and to configure IP.

When should the firmware be updated ?

➔ Firmware should be updated when ICPDAS announces

- Support for new I/O modules
- The addition of new functions
- Bug fixes and revision

There is a document (Revision.txt) that records the update information as follows:

```
/*********************************************/
/*  Reversion information for I-8000 firmware  */
/*   8K232.exe, 8K485.exe, 8KE10.exe           */
/*                                             */
/*********************************************/
=====================================================
  A1.95 [Oct,14,2003] by Kevin
        Support:
           1. 8037 (command sets are same as 8057)

        Note:
           1. DCON Utility must update to ver. 4.2.7
              to support 8037.
```

For more details, please refer to Appendix E: Updating the firmware and MiniOS7 image.

Dual Bus design to supports i-8K and i-87K series I/O modules

The 8430/8830 has two types of bus on its back plane. The first is a serial bus (RS-485 interface) for 87K I/O modules and the second is a parallel bus for 8K I/O modules. The DCON firmware can support both 8K and 87K series I/O modules. These two series I/O modules can both be connected into the same I-8000 MCU, and can use the same DCON command when they are both attached to I-8000 MCU. The modules for DI, DO, DIO, AI, AO and Counter/Frequency purpose are supported. Other modules, such as multi-serial port (8112, 8144, 8142, 8144), MMC (8073), motion (8090, 8091), are not supported by the DCON protocol. For more details, please refer to Appendix D: i-8K and i-87K series I/O modules.

For more about I/O module's information, please refer to
CD:\ Napdos\DCON\IO_Module\hw_dcon_on_8KUnit
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/hw_dcon_on_8kunit/

More flexible I/O combination and Compact、fasten、quick to install

The 8430/8830 control units contain either a 4-slot or 8-slot bus to allow various i/o modules to be connected, removing the need for complex wiring between i/o modules. Furthermore, various I/O modules can be inserted into the slots at the same time, such as digital input/output, analog input/output and counter modules, and each I/O module allows various numbers of channels. For example, with i-8040 or i-8041, the 8830 provides max 256 digital input or digital output channels.The module can simply be plugged into the slot and secured to the plastic base using a pair of locking buttons. The assembly can then be mounted on the control box using DIN rail clips.

Built-in Watchdog

The built-in watchdog circuit will reset the CPU module if a failure occurs in either the hardware or software. If the application program does not refresh the watchdog timer within 1.6 sec, the watchdog circuit will initiate a reset of the CPU.

Input Protection circuitry

The protection circuitry on both the network and power supply protects the system from external signals such as main spikes and ambient electrical noise. In addition, the central processing module is isolated from external signals in three ways. This is achieved through I/O isolation of 3KV, power isolation to 3KV and network isolation to 2KV

High performance integrated power supply

The built-in isolated 20W power supply is rated to perform linearly up to full loading.

Ventilated housing design to work between -25 ~+75℃

The 8430/8830 is housed in a plastic base box with a column-like ventilator, that can help to cool the work environment inside the box and allow the 8430/8830 to operator between -25℃ and +75℃.

1.2 Specifications

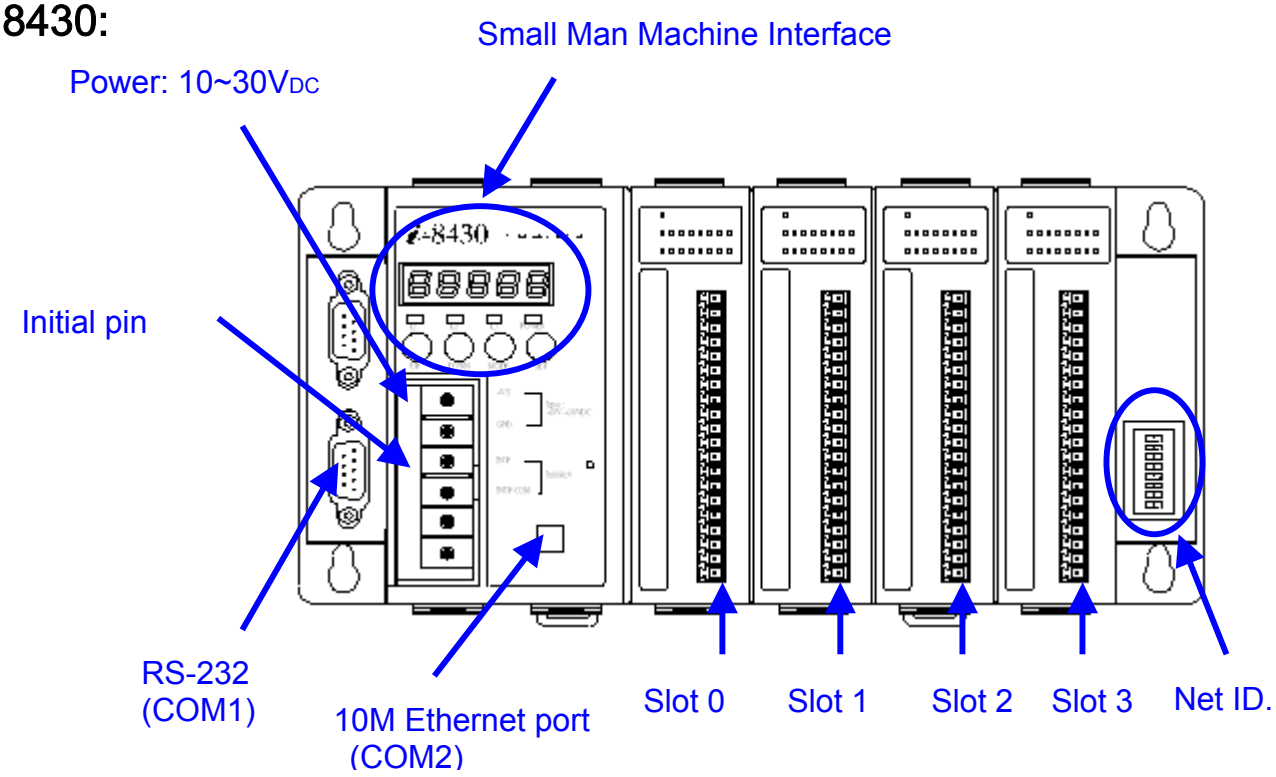
- **CPU**:
  80188 or compatible
  16-bits
  40MHz
- **SRAM:**
  512KBytes
- **Flash ROM:**
  512KBytes
  8 sectors, each sector has 64KBytes
  100,000 erase/write cycles
- **EEPROM:**
  2K bytes
  8 blocks, each block has 256Bytes
  1,000,000 erase/write cycles
- **Built-in Watchdog Timer**
  0.8 seconds
- **COM0 (RS-232)**:
  TXD, RXD, GND, internal serial bus.
  Fixed communication speed at 115200 bps.
  Used to communicate with 87K modules connected to the slots.
- **COM1 (RS-232)**:
  TXD, RXD, GND
  Communication speed: programmable, 115200 bps max.
  Used to download firmware, update the MiniOS image file and to configure the IP information
- **COM2 (Ethernet port)**:
  10BaseT NE2000 compatible
  PC application use Ethernet to communicate with DCON Firmware.
- **COM3 (RS-232/485)**:
  RS-232 (TXD, RXD,GND, CTS, RTS) or
  RS-485 (DATA+, DATA-)
  Communication speed: programmable, 115200 bps max.
- SMMI (Small Man Machine Interface)
  5-digit LED display
  4 LED indicators
  4 push buttons

- **I/O expansion slots:**
  4 slots for 8430
  8 slots for 8830
- **Mounting mechanism**
  pannel mounting and din-rail mounting
- **Power supply:**
  20W
- **Power requirement:**
  10 ~ 30 V_{DC}
- **Power consumption:**
  3.9 W (for 8430)
  5.1 W (for 8830)
- Operating Environment:
  Operating Temp.: –25°C to +75°C.
  Storage Temp.: –30°C to +85°C
  Humidity: 5 ~ 95%,non-condensing
- Dimension:
  230 x 110 x 75.5 mm (for 8430)
  354 x 110 x 75.5 mm (for 8830)

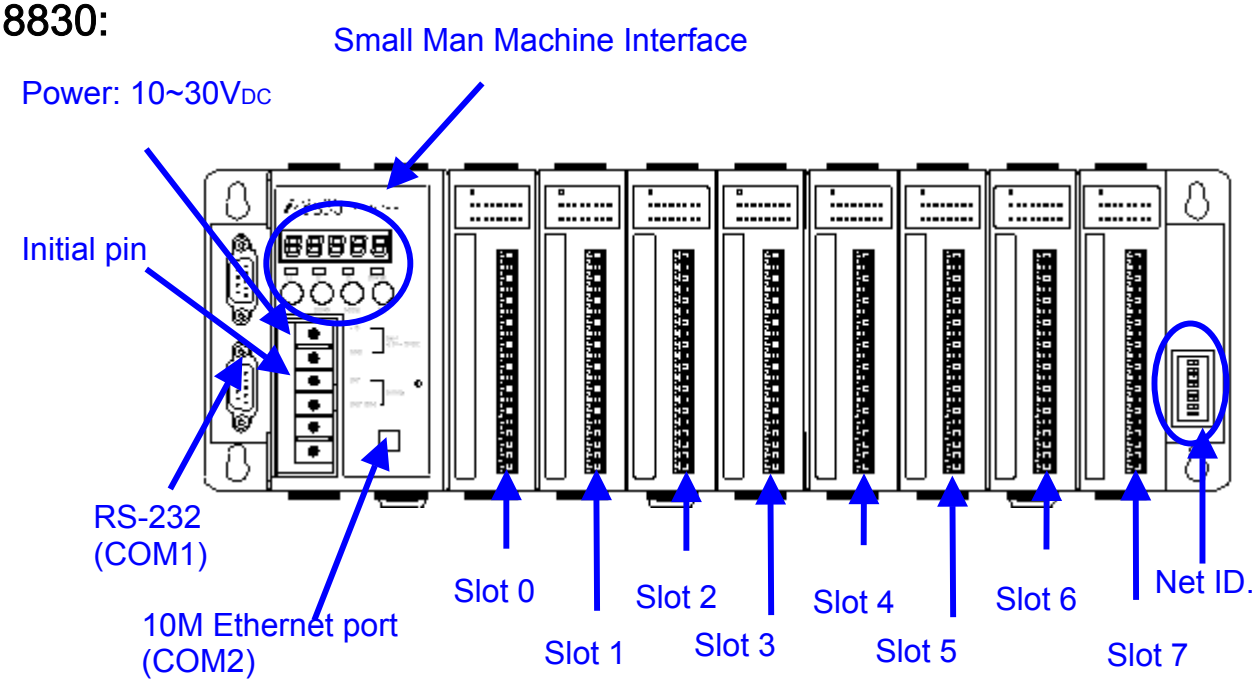
  For more detailed dimensions, please refer to “Appendix A:Dimensions”.

1.3 Front view of 8430/8830

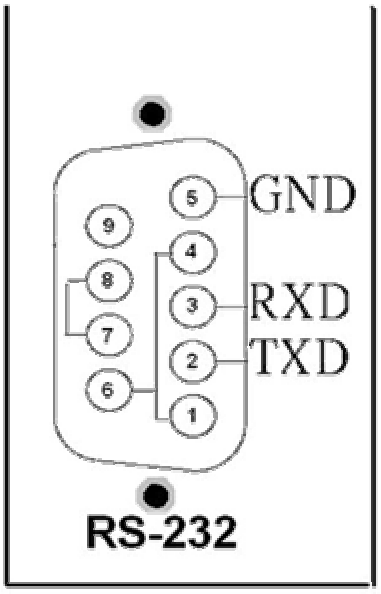
8430:



8830:

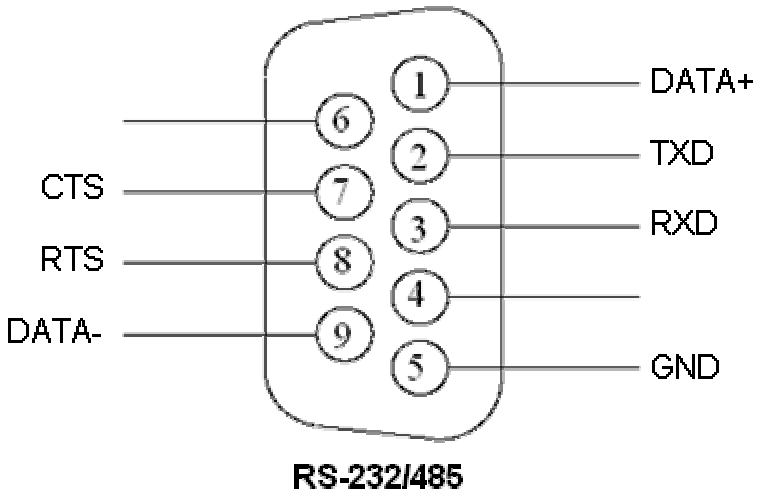


Pin assignment of COM1 Port



The COM1 Pin assignment of 8430/8830

Pin assignment of COM3 Port

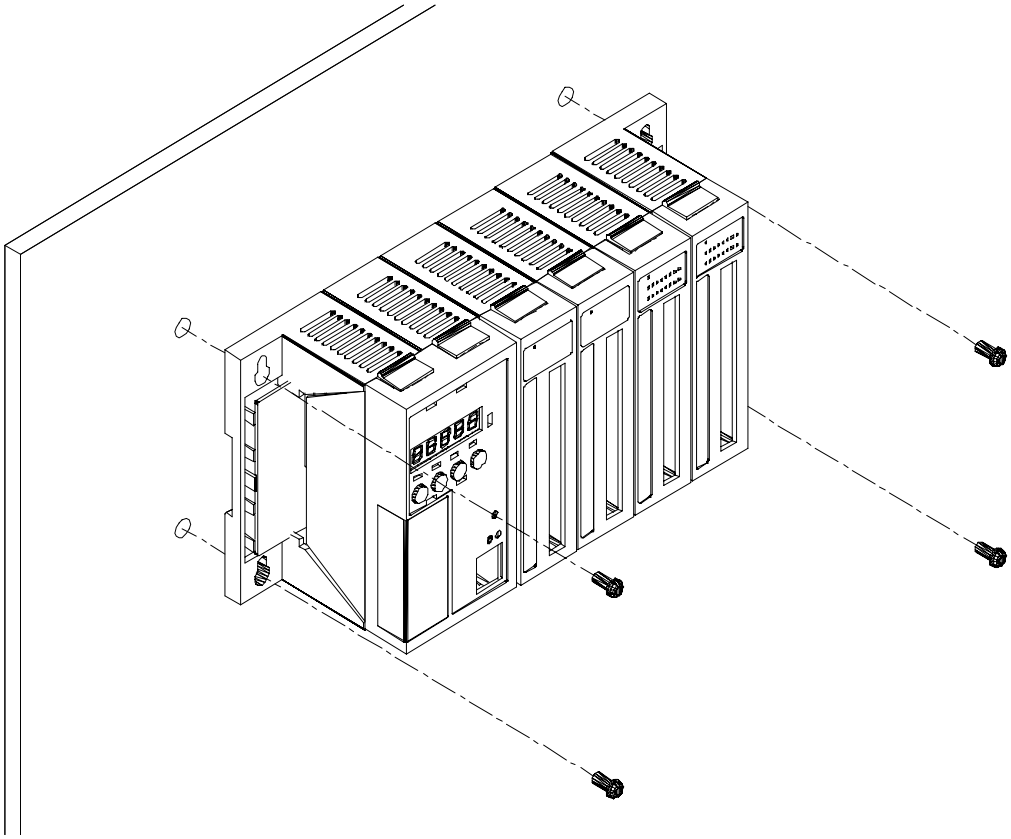


The COM3 Pin assignment of 8430/8830

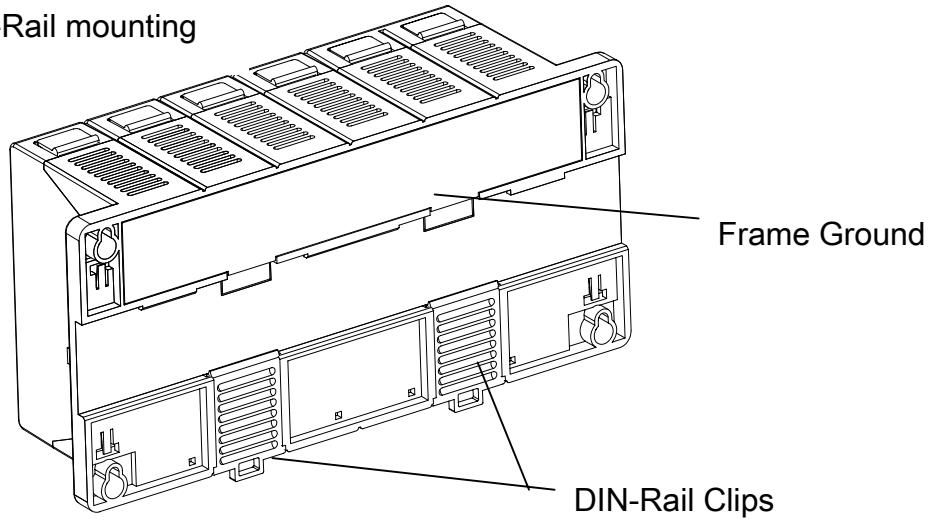
1.4 8430/8830 installation

Step1: Mount the I/O unit

Method (a): using screw panel mounting

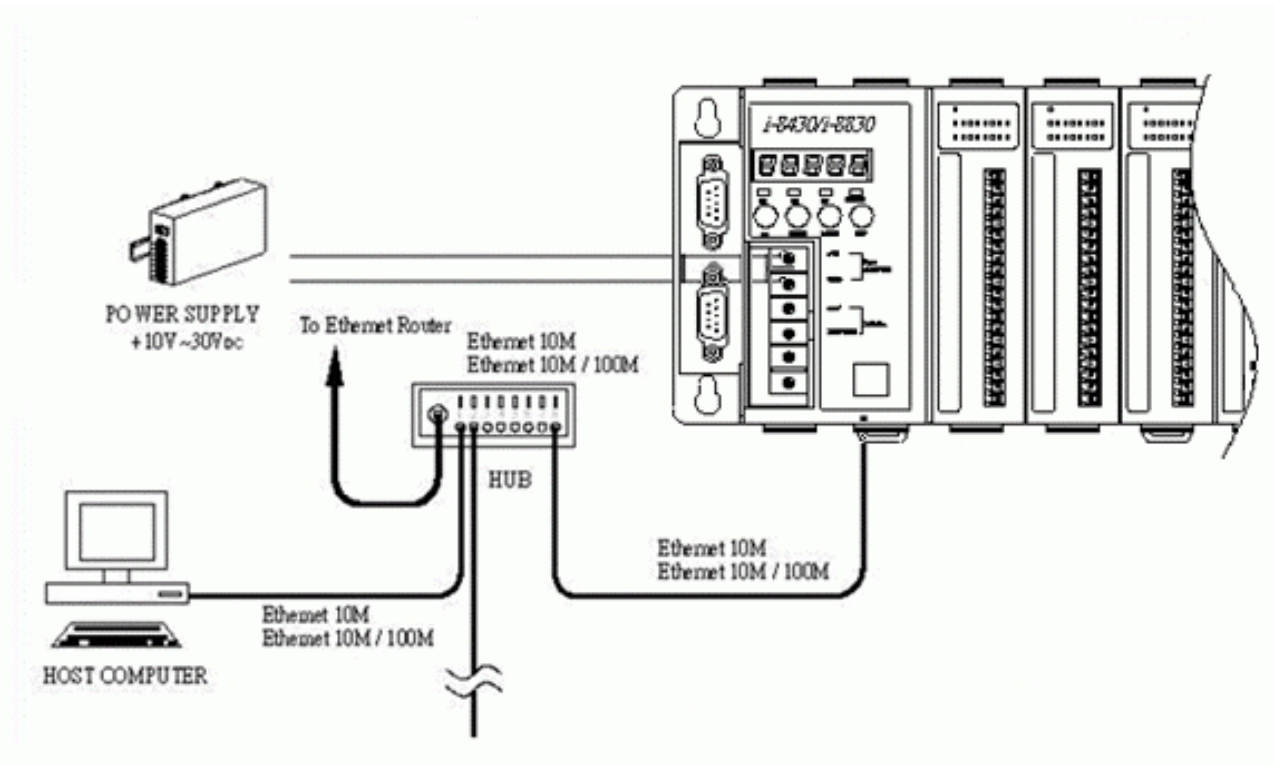


Method (b): DIN-Rail mounting



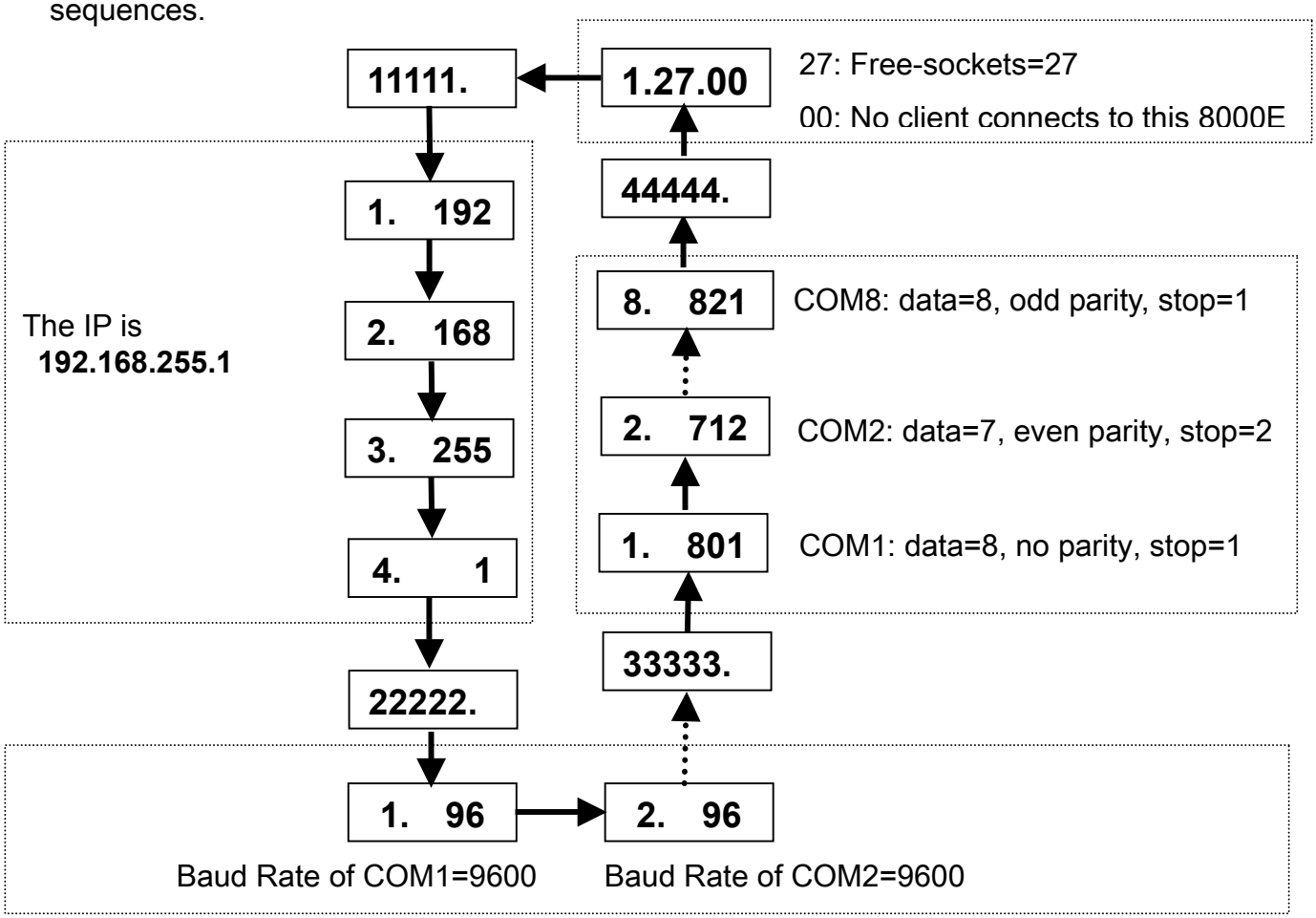
Step2: Attach power supply (10 ~ 30 V_{DC})

The diagram below shows the basic wiring for the Ethernet I/O.



Step3: Check the LED display

The LED constantly shows IP address, Baud Rate, Data Bit Format ..etc as following sequences.



1.5 I/O module installation

Step1: Read the document at the following location

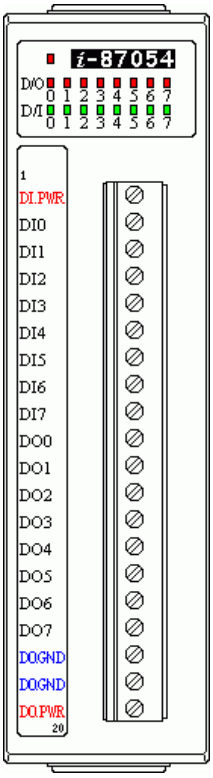
For I-8000 series modules the files are located at:

CD:\ Napdos\DCON\IO_Module\hw_dcon_on_8KUnit\8k
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/hw_dcon_on_8kunit/8k/

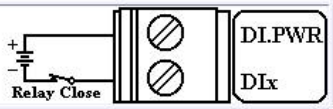
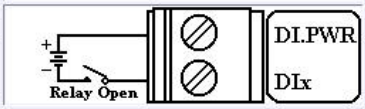
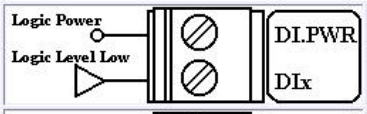
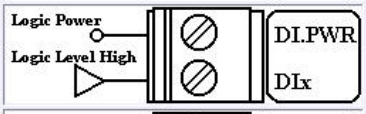
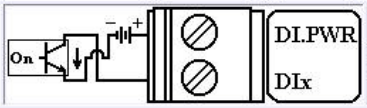
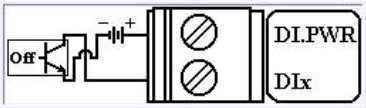
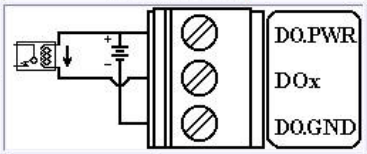
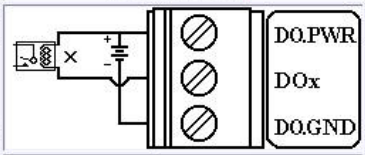
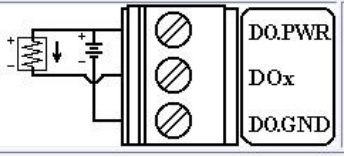
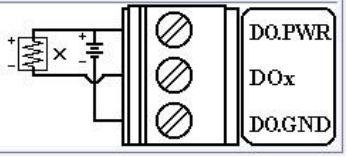
For I-87K series modules the files are located at:

CD:\ Napdos\DCON\IO_Module\hw_dcon_on_8KUnit\87k
ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/hw_dcon_on_8kunit/87k/

These *.chm files include the I/O module specifications, pin assignments, wire connections. For example, the pin assignments and wire connections are as follows.

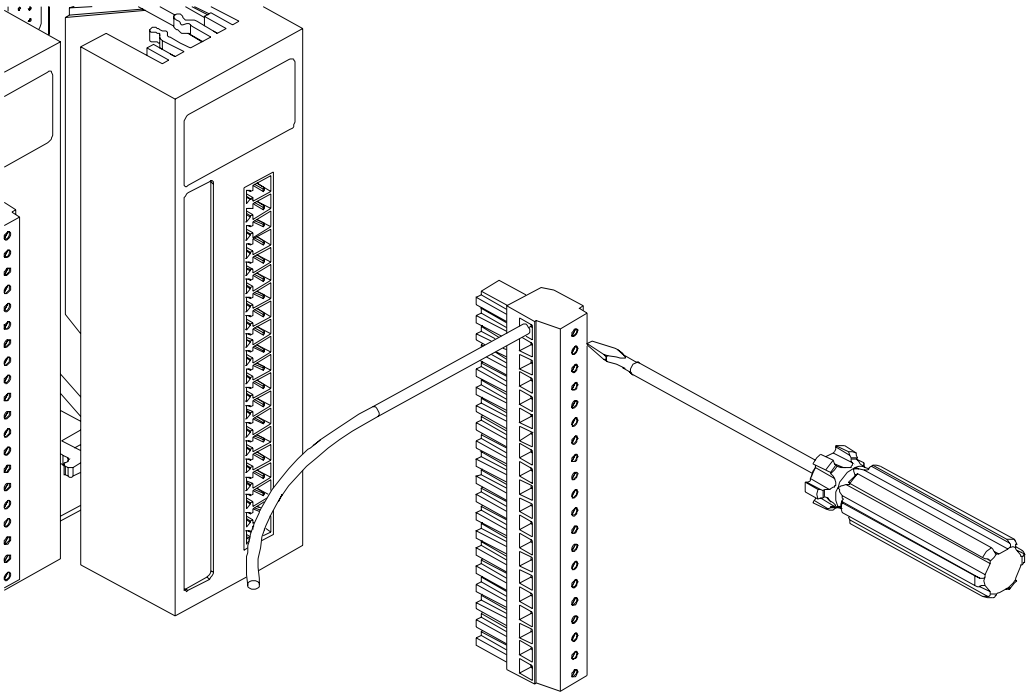


Pin assignment

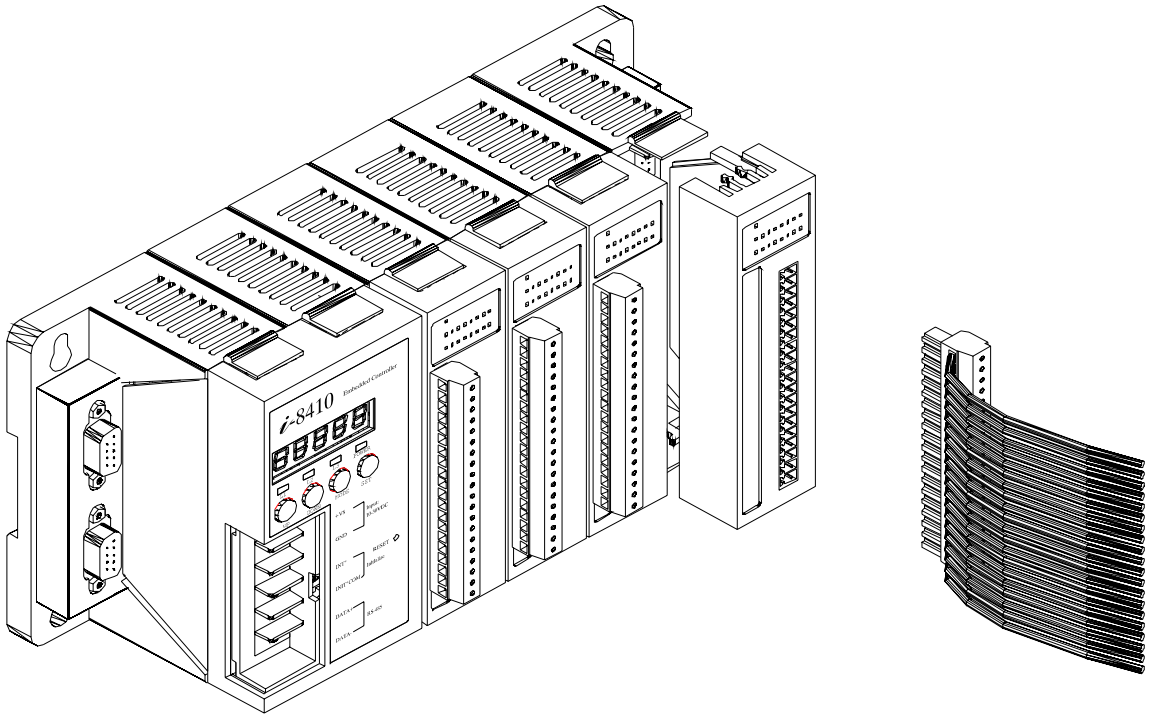
Input Type	ON State LED ON Readback as 1	OFF State LED OFF Readback as 0
Relay Contact		
TTL/CMOS Logic		
Open Collector		
Output Type	**ON State LED ON Readback as 1**	**OFF State LED OFF Readback as 0**
Drive Relay		
Resistance Load		

Wire Connection

Step2: Connect the wire



Step3: Insert the I/O module into the 8430/8830



Chapter 2. Configuring the 8430/8830 and I/O modules

Before using the 8430/8830 and any I/O modules connected to it, the following settings must be configured:

- **Networking settings**: IP, Mask, Gateway of 8430/8830
- **Power on value** of AO, DO modules
- **Safe value** of AO, DO modules
- **Input range** of AI modules
- **Noise filter** of AI modules
- **Check sum** of all communication protocol

The most important thing at the beginning stage is the network setting. After assigning the network setting, the VxComm Utility can be used to create a virtual COM port to map the 8430/8830, and then the DCON utility can be used to configure other settings.

2.1 Configure the network settings

Network settings can only be configured via the RS-232 COM Port.
There are two tools that can be used to configure the network settings of 8430/8830. The first is “Configuration Wizard” and the other is the MiniOS7 Utility.

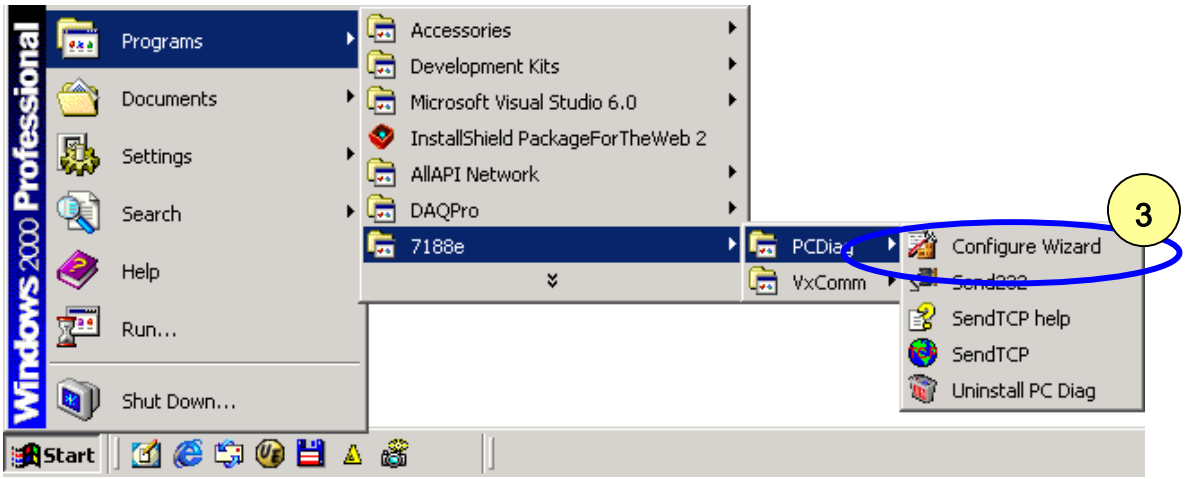
2.1.1 By “Configuration Wizard”

The “Configuration Wizard” gives step by step information for configuring the network settings. The wizard is most useful for detecting the host PCs network settings, searching the local network to locate a valid IP, Mask and Gateway address. Using the “Configuration Wizard”, allows automatic detection of the important settings, removing the need to contact system administrators for support.

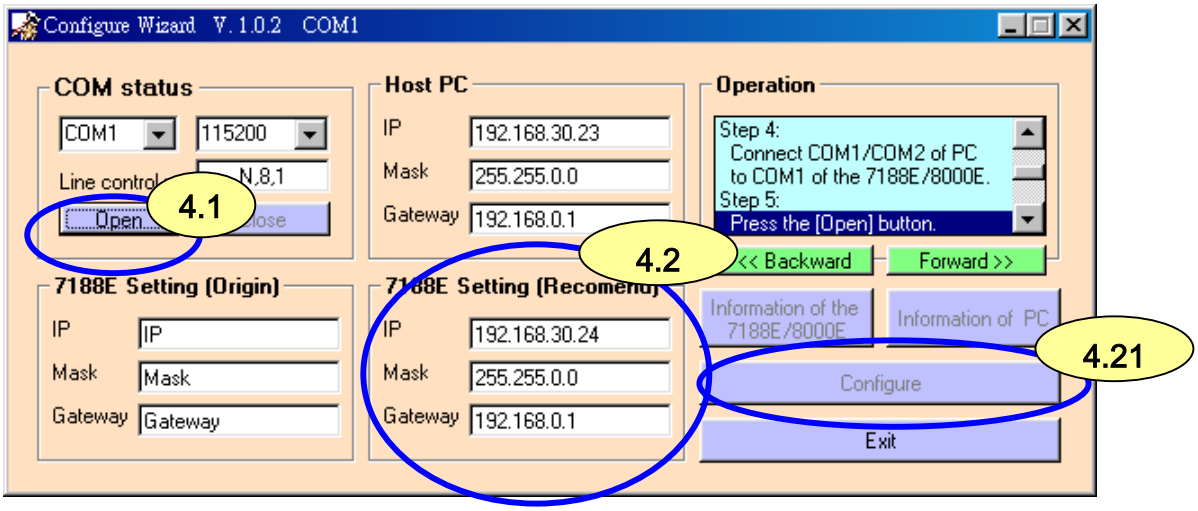
Step1: Use CA-0915 to connect COM1 of 8430/8830 to COM1/2 of the host PC.

Step2: Install PCDiag to the host PC by running
CD:\Napdos\7188e\tcp\PCDiag

Step3: Follow the instructions given by the “Configuration Wizard” until the following window appears



Step4: Open the COM port and then click “Configure” to set the IP, Mask, Gateway to 8430/8830.



Step5: Exit the “Configuration Wizard” and then restart the 8430/8830 for the new settings.

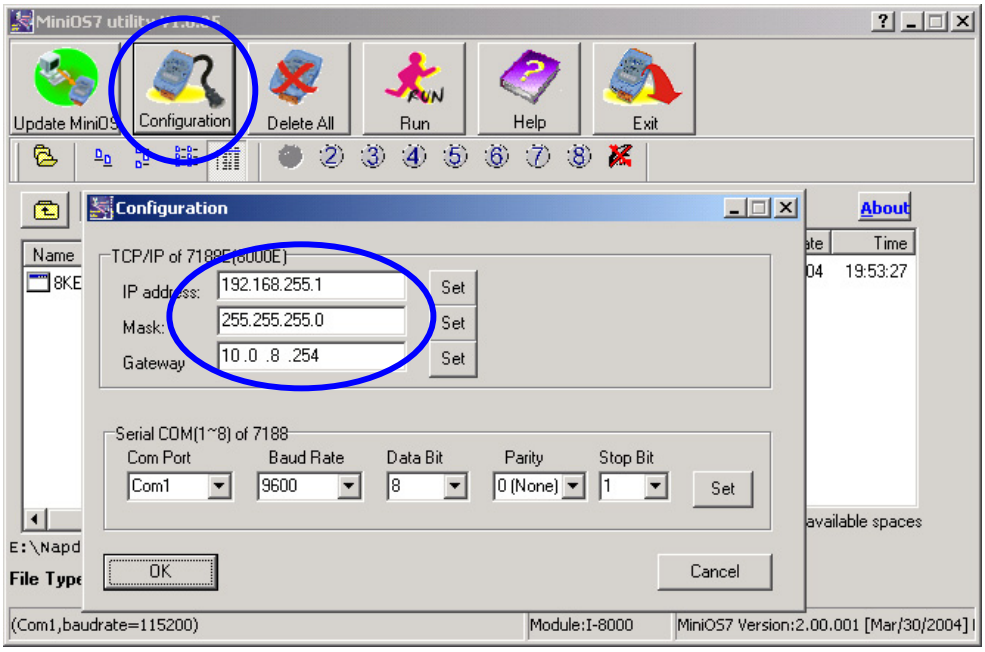
2.1.2 By MiniOS7 Utility

The MiniOS7 Utility is used to download files and update the OS image to the 8430/8830. It can also be used to configure the network and COM port settings. In contrast to “Configuration Wizard”, users must have valid IP, Mask, Gateway information and must manually enter it into the text box provided.

Step1: Use CA-0915 to connect COM1 of 8430/8830 to COM1/2 of the host PC.

Step2: Install the MiniOS7 Utility on the host PC by running
CD:\Napdos\MiniOS7\Utility\MiniOS7_Utility\MiniOS7_Utility.exe

Step3: Run the MiniOS7 Utility and click “Configuration”



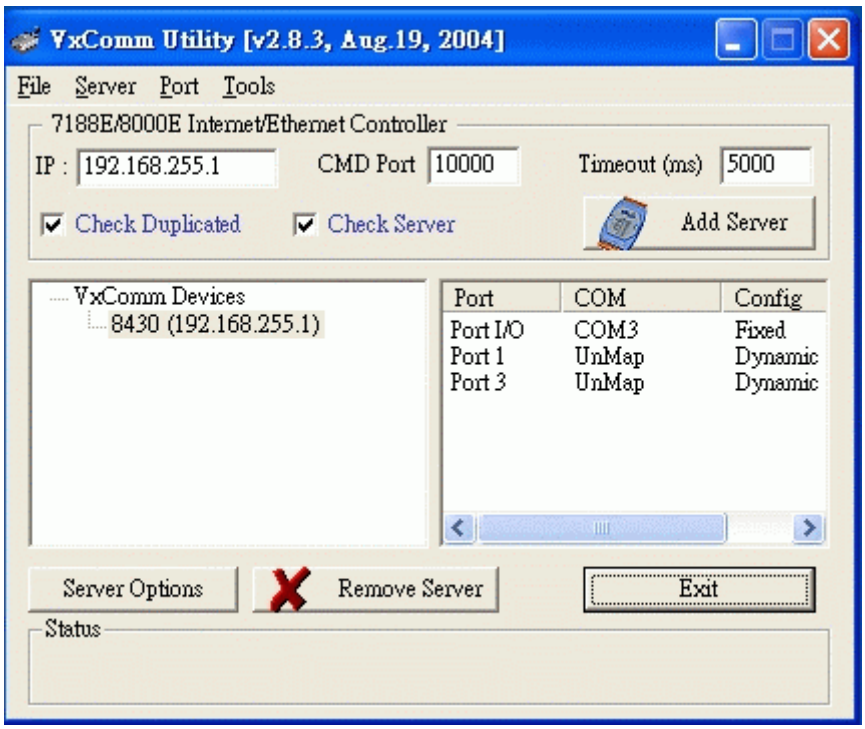
Step4: Exit the MiniOS7 Utility and then restart the 8430/8830 for the new settings.

2.2 Creating a virtual COM port to map the I/O modules

Step1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

Step2: Install the VxComm driver appropriate for your PC (95/98/NT/2000/XP)
CD:\Napdos\7188e\tcp\VxComm\Driver(PC)\

Step3: Run the VxComm Utility and connect to the 8430/8830

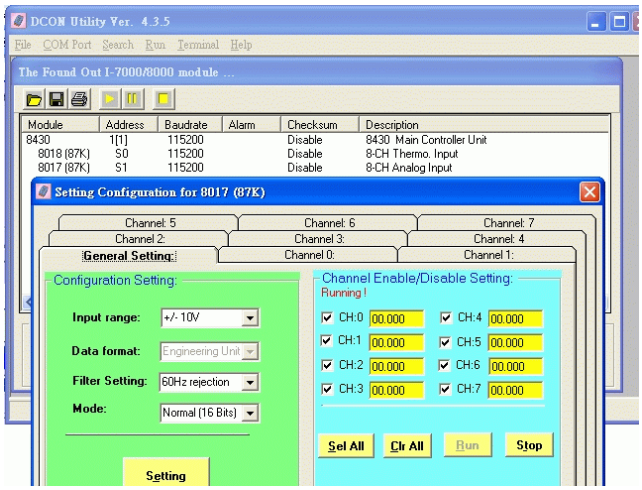


Step4: Map the “Port I/O” to a virtual COM port.

Step5: Exit the VxComm Utility

2.3 Configure I/O modules

The DCON Utility is used to configure I-7000, I-8000 and I-87K series I/O modules and communicates with I/O modules via the COM port. For I/O modules on the i-8430 and i-8830, using the VxComm technique can let DCON Utility to access the I/O modules via the Ethernet.


DCON Utility Ver. 4.3.5
File COM Port Search Run Terminal Help
The Found Out I-7000/8000 module ...
Module Address Baudrate Alarm Checksum Description
8430 1[1] 115200 Disable 8430 Main Controller Unit
8018 (87K) S0 115200 Disable 8-CH Thermo. Input
8017 (87K) S1 115200 Disable 8-CH Analog Input
Setting Configuration for 8017 (87K)
Channel 5 Channel 6 Channel 7
Channel 2: Channel 3: Channel 4
General Setting: Channel 0: Channel 1:
Configuration Setting:
Input range: +/- 10V
Data format: Engineering Unit
Filter Setting: 60Hz rejection
Mode: Normal (16 Bits)
Setting
Channel Enable/Disable Setting:
Running !
CH:0 00.000 CH:4 00.000
CH:1 00.000 CH:5 00.000
CH:2 00.000 CH:6 00.000
CH:3 00.000 CH:7 00.000
Sel All Clr All Run Stop

DCON Utility

Main functions

Configuring modules

Baudrate

Address

Check sum

Power on value

Safe value… etc.

Testing I/O actions

Modules supported:

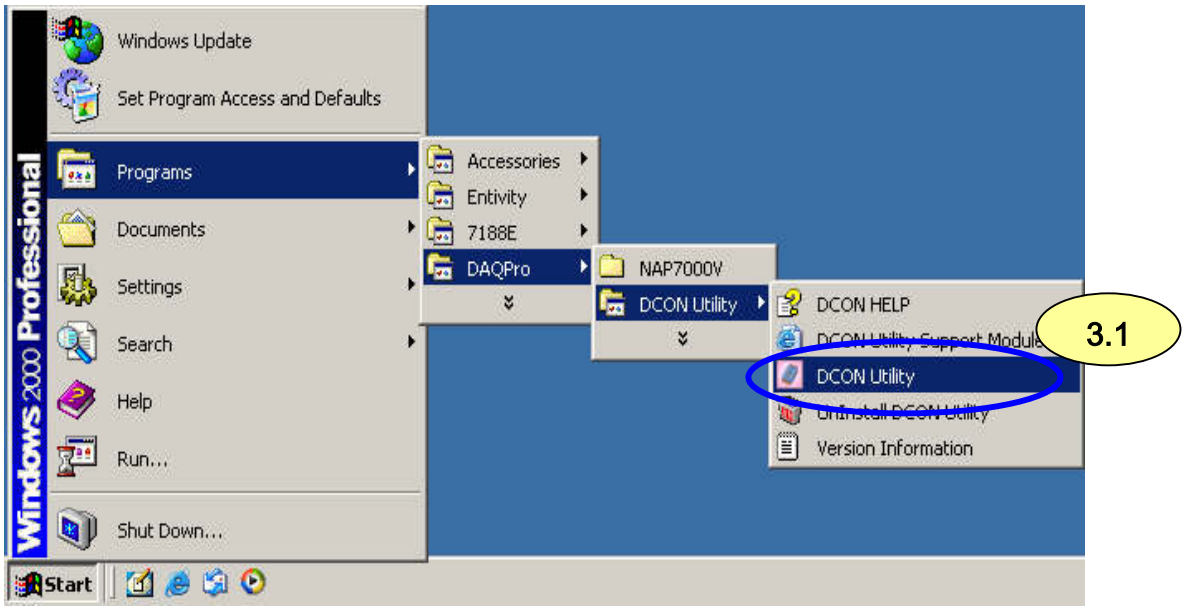
i-7000/i-8000/i-87K series

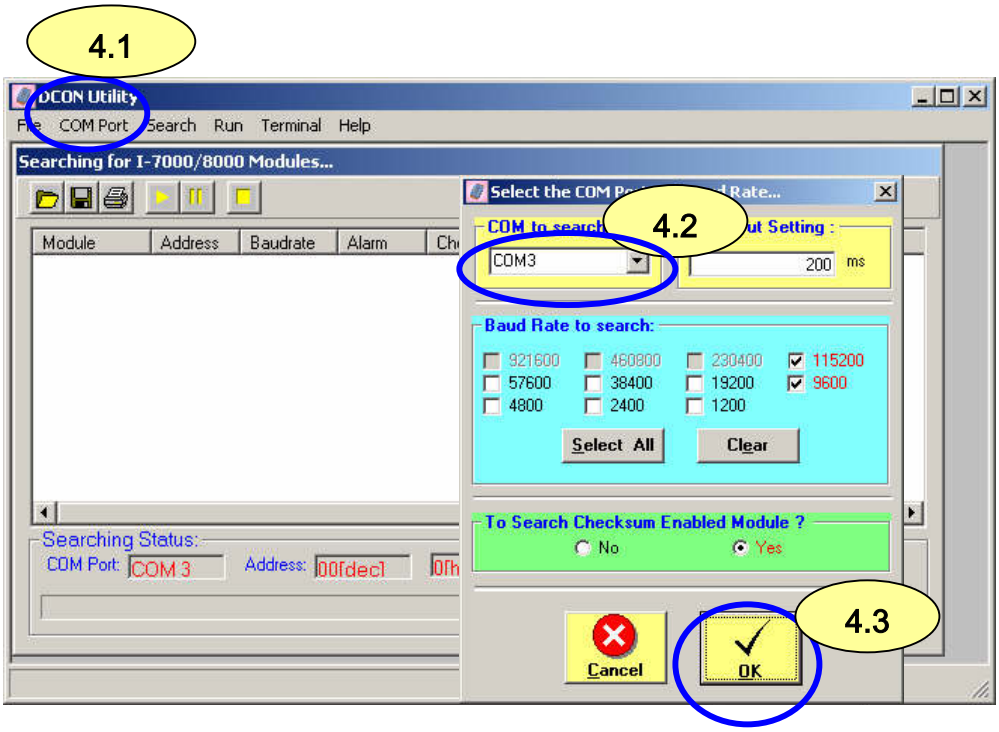
(with DCON protocol)

Step1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

Step2: Create a virtual COM port (for example: COM3) to map the I/O modules

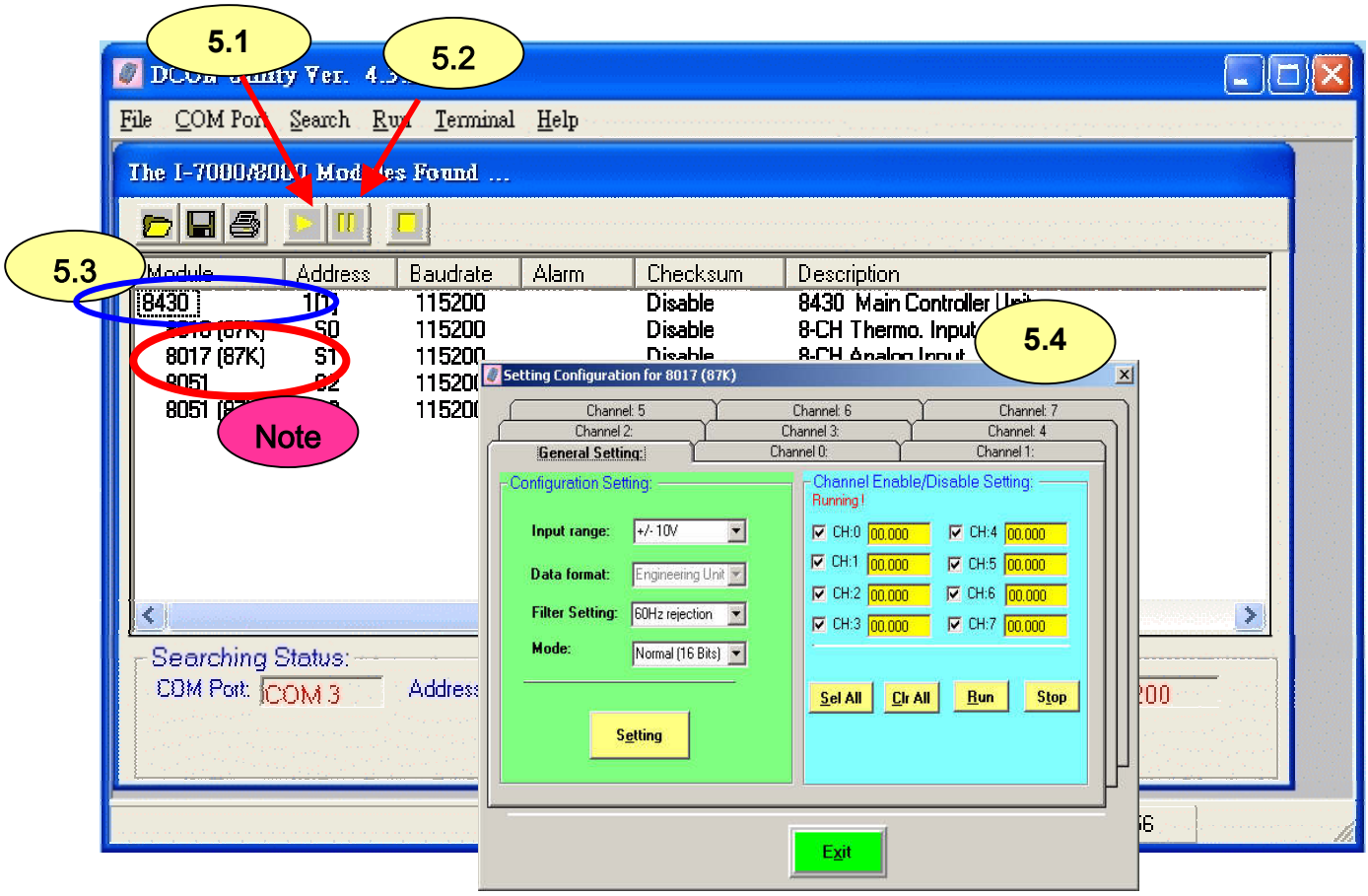
Step3: Install the DCON Utililty by running
CD:\Napdos\Driver\DCON_Utility\Setup\setup.exe and then run it.





Step4: Change the COM port to the virtual COM port. Note: for 8430/8830, the Baud Rate is unimportant. Any Baud Rate setting can be used.

Step5: Search for the I/O modules on the 8430/8830. After the modules are found, individually click on them to configure them.

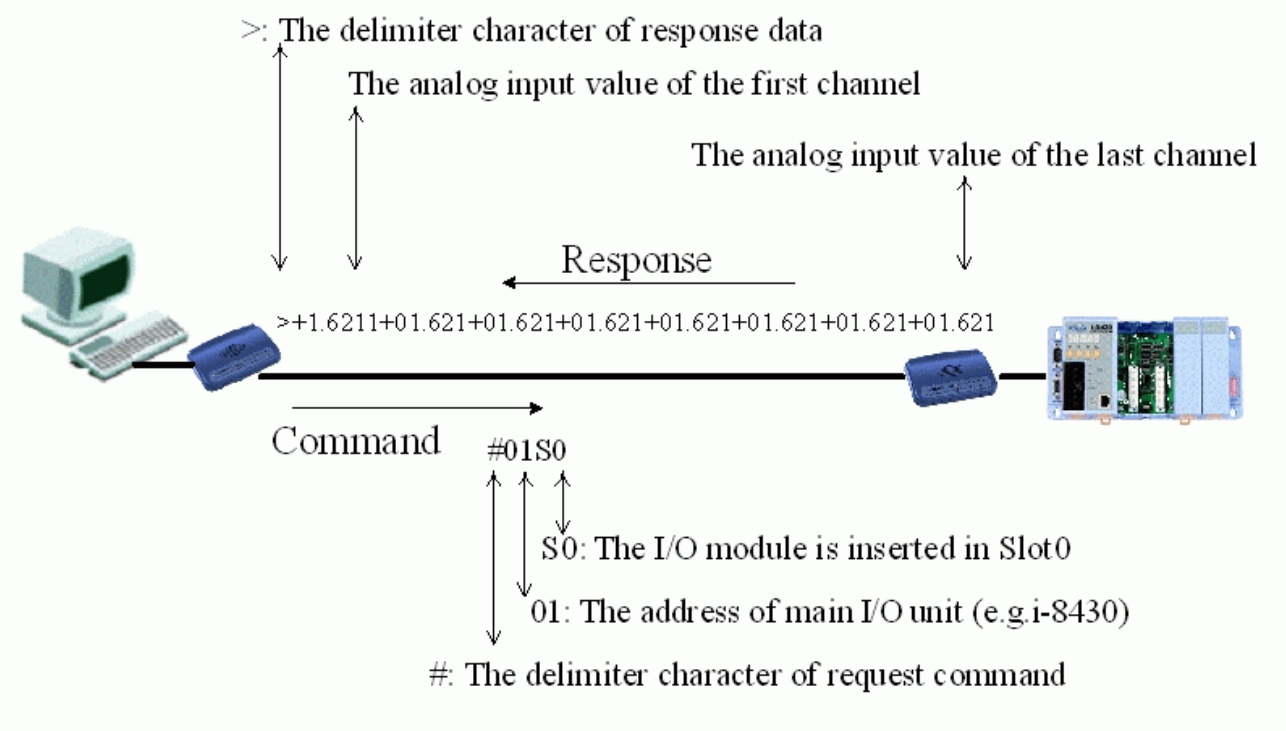


Note: All the 87K I/O modules that connected to 8430/8830 are renamed to 80xx(87K)

Chapter 3. Developing an application using the DCON Protocol

3.1 The feature of using DCON Protocol

The DCON firmware which uses ASCII Command provided with the 8430/8830, is easy to use and most of application can be developed using toolkits supported by ICPDAS, such as DLL, ActivateX or OPC Server, which can shorten their development time.


>: The delimiter character of response data
The analog input value of the first channel
The analog input value of the last channel
Response
>+1.6211+01.621+01.621+01.621+01.621+01.621+01.621+01.621
Command
#01S0
S0: The I/O module is inserted in Slot0
01: The address of main I/O unit (e.g.i-8430)
#: The delimiter character of request command

3.2 Using the TCP protocol directly

Supports the DCON communication protocol on the Ethernet port. A TCP program can be used to develop Ethernet Applications to communicate with Ethernet port 9999 of the 8430/8830.

The following steps show how to use VB Winsock component .

Step 1. Connect to the Ethernet controller

```
Winsock1.RemoteHost = "192.168.255.1"   'IP Address of Ethernet controller
Winsock1.RemotePort = 9999              'Port Number of Ethernet controller
Winsock1.Connect
```

Step 2. Send command with cr

```
Winsock1.SendData ("$01M" & vbCr)
'Send the command "$01M" with a (cr) character
'to request the module name of the controller
```

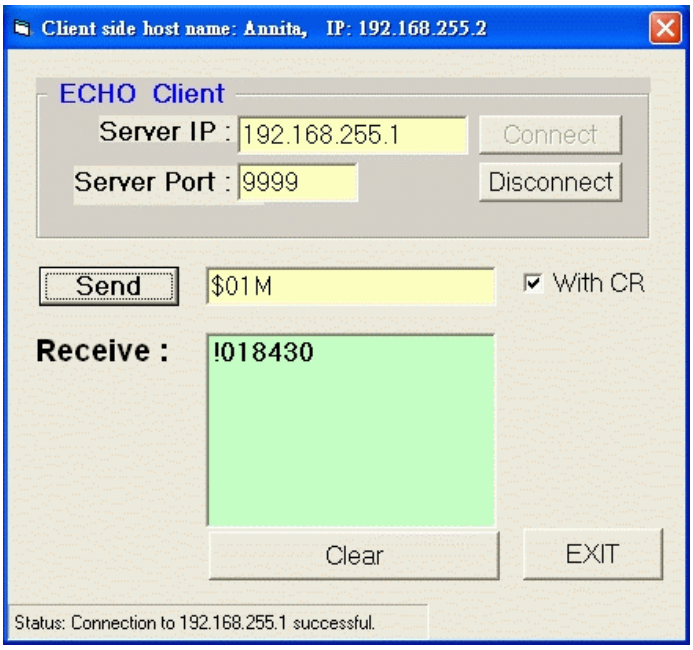
Step 3. Receive data from Ethernet controller

```
Winsock1.GetData vtdata, vbString    'Get the response data from the Ethernet controller
```

Step 4. Close connection.

```
Winsock1.Close      'Close the socket between the PC and the Ethernet controller
```

The result will be as below.



This TCP application uses the DCON Protocol to communicate with Ethernet port 9999 of the i-8430 Ethernet I/O controller .

The demo program can be found at

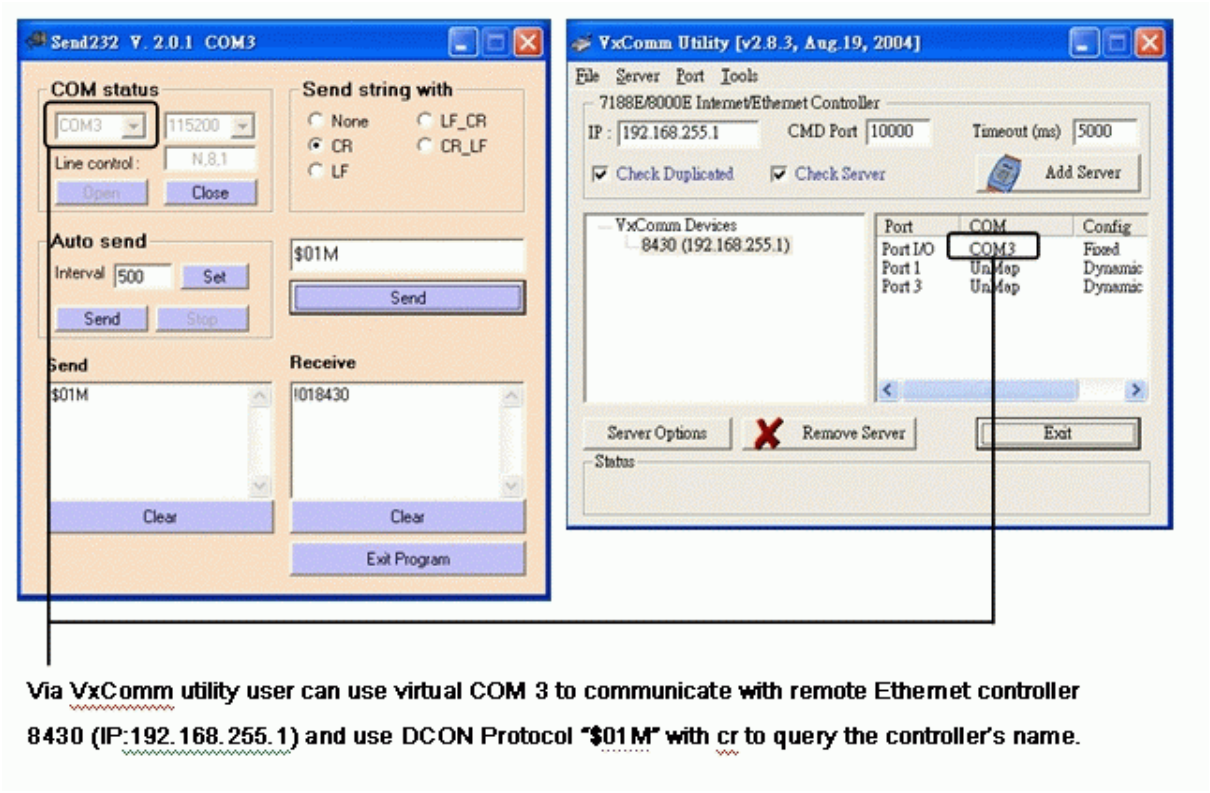
CD:\Napdos\8000\843x883x\TCP\Xserver\Client\Common\VB5\Client4

Or on the internet at

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/8000/843x883x/tcp/xserver/client/common/vb5/client4/

3.3 Via VxComm technology

VxComm (“Virtual Communication Port”) is a technique that allows a COM Port to be used to communicate with an ICPDAS Ethernet control unit. The Diagram below show how to use VxComm Utility to map PC’s COM Port to 8430’s Ethernet I/O Port.

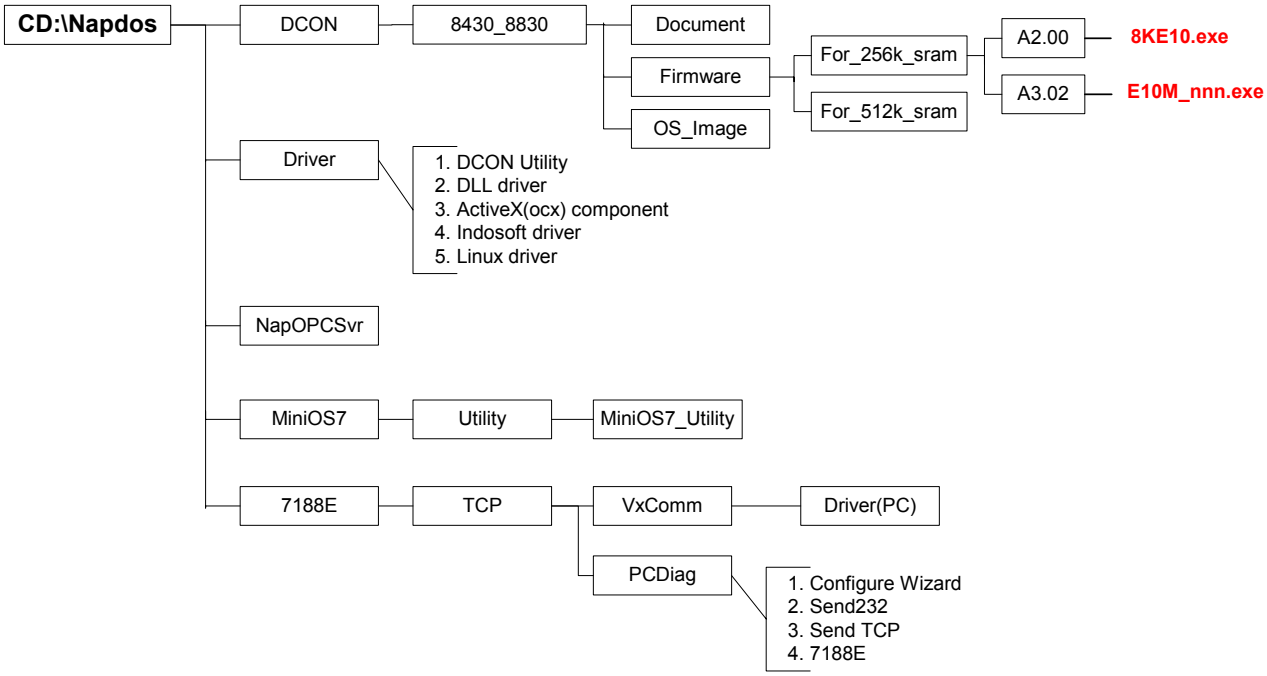


Via VxComm utility user can use virtual COM 3 to communicate with remote Ethernet controller 8430 (IP:192.168.255.1) and use DCON Protocol “$01M” with cr to query the controller’s name.

Chapter 4. Software Development ToolKit (free)

4.1 Location of documents and software

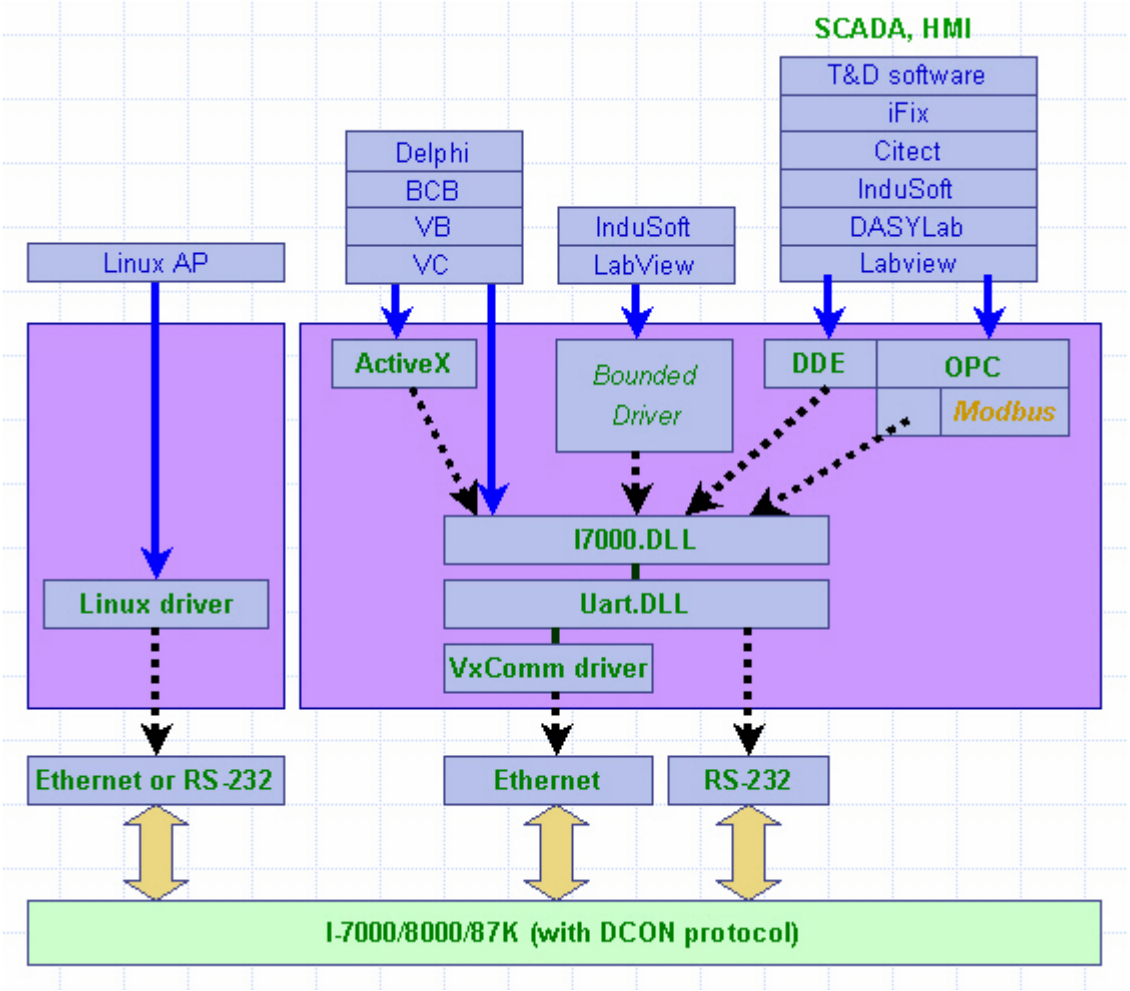
The location of all documents and software related to the 8430/8830 are shown in the following directory tree. The relevant file can quickly be located by referring to the tree.



Various SDKs are provided for the DCON protocol, such as DLL, ActiveX, Labview driver, Indusoft driver, Linux driver, OPC server, etc. Each SDK also contains a number of helpful free demo programs and documents, which can be found on the CD included in the package, or can be downloaded from the ICP DAS web site or FTP site..

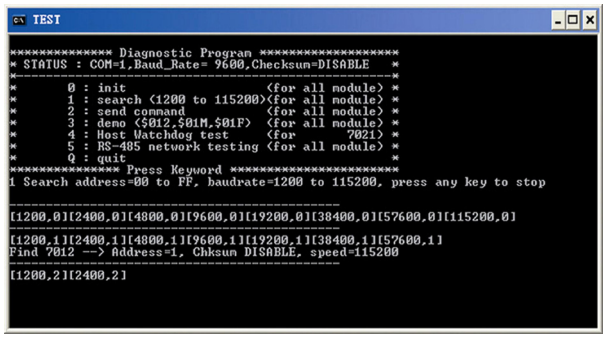
When planning the development of a system, appropriate software solutions should be chosen to suit different situations. Following chart shows the relation between the software solution and the SDK provided. Refer to the chart to find a solution to meet your requirements.

The diagram below show the architecture of the SDK.



Note: All the above SDKs are based on VxComm technology when using an Ethernet interface.

4.2 DCON Utility (DOS)


TEST
********** Diagnostic Program **********
* STATUS : COM=1,Baud_Rate= 9600,Checksum=DISABLE *
0 : init (for all module)
1 : search (1200 to 115200)(for all module)
2 : send command (for all module)
3 : demo ($012,$01M,$01F) (for all module)
4 : Host Watchdog test (for 7021)
5 : RS-485 network testing (for all module)
Q : quit
********** Press Keyword **********
1 Search address=00 to FF, baudrate=1200 to 115200, press any key to stop
[1200,0][2400,0][4800,0][9600,0][19200,0][38400,0][57600,0][115200,0]
[1200,1][2400,1][4800,1][9600,1][19200,1][38400,1][57600,1]
Find 7012 --> Address=1, Chksum DISABLE, speed=115200
[1200,2][2400,2]

DCON Utility (DOS)

DCON Utility (DOS version)

Supported modules:

i-7000/8000/87K series

(with DCON protocol)

Supported demos:

C

Supported OS:

DOS

File location:

CD:\Napdos\Driver\DCON_DOS

4.2.1 Procedure for using the DCON Utility (DOS)

Step 1: Read the basic and important documents

Readme.txt: contains the basic and important information, including:

- What is DCON Utility (DOS)
- What files are installed on the PC

Step 2: Read manuals for how to start

DCON_DOS.pdf:

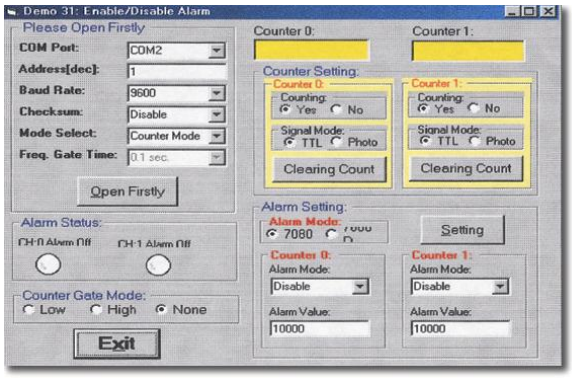
Explains how to use the DOS version utility to diagnose/configure the I/O modules and how to use the C language to develop your first program running under DOS.

The manual explains following details:

- How to include the lib to C
- How to develop a program in C
- Demo list
- Function descriptions and usage

Step 3: Run DCON_DOS\Diag\test.exe to diagnose the I/O modules.

4.3 DCON DLL



DCON DLL

DLL library

Supported modules:

i-7000/8000/87K series

(with DCON protocol)

Supported demos:

VB/VC/BCB/Delphi

Supported OS:

Windows 98/NT/2K/XP

File location:

CD:\Napdos\Driver\DCON_DLL

4.3.1 Procedure for using the DLL

Step 1: Read the basic and important documents

Readme.txt: contains most basic and important information, including:

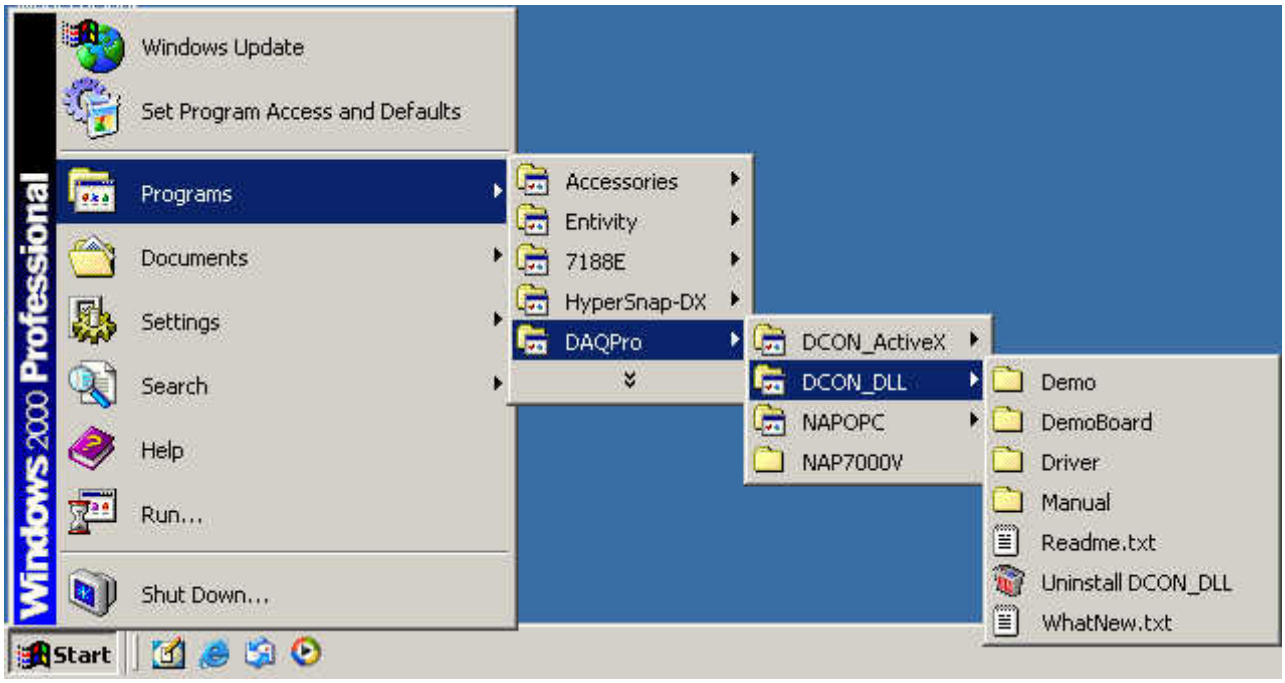
- What is DCON DLL
- What files are installed on the PC
- The directory tree installed on the PC
- Demo list

WhatsNew.txt: contains the version/reversion history information, including

- Bugs fixed
- Demos added or modified
- Updated DLL details

Step 2: Install the DCON DLL by executing:
CD:\Napdos\Driver\DCON_DLL\Setup\setup.exe

After installation, all related information can be found below



QuickStartManual.pdf:
Explains how to develop your first program using the DLL.

DCON_DLL.pdf explains the following details

- How to include the DLL in VB/VC/Delphi/BCB
- How to develop a program in VB/VC/Delphi/BCB
- Demo list
- Function descriptions and usage

FAQ.pdf:
Gives solutions to frequently asked questions.

Step 3: Run the demo programs to test the I/O module and learn the functions

4.3.2 VB Example (Reading an analog input value)

The following is an example of reading analog values from an I-87017 inserted in slot 0 of an 8430/8830.

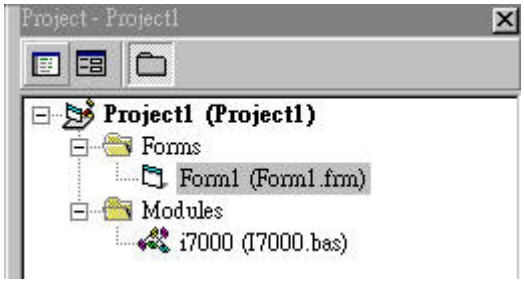
Step 1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

Step 2: Run the VxComm Utility to create a virtual COM port (e.g. COM3) to map the 8430/8830

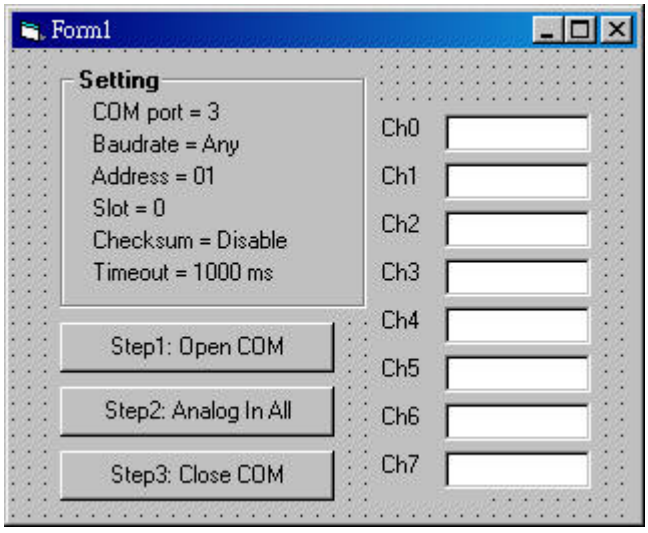
Step 3: Run the DCON Utility to configure the I/O modules

Step 4: Run VB and create a new project (.exe project)

Step 5: Add I7000.bas to the project



Step 6: Arrange all the components on the form



Step 7: Write the program code

VB Step 3

```
Private Sub cmdCloseCOM_Click()
    Close_Com (3)
End Sub
```

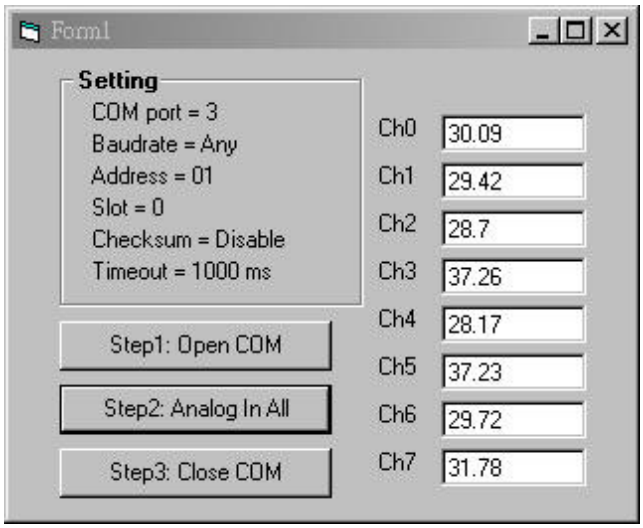
VB Step 1

```
Private Sub cmdOpenCOM_Click()
    Dim iRet As Integer

    iRet = Open_Com(3, 9600, 8, 0, 1)
        'COM port = 3
        'Baudrate = 9600  (for 8430/8830 , any baudrate is ok)
        'Data bit = 8     (fixed     8430/8830 )
        'Parity = none    (fixed for 8430/8830 )
        'Stop bit = 1     (fixed for 8430/8830 )
    If iRet <> 0 Then
        MsgBox "Open COM port error !"
    End If
End Sub
```

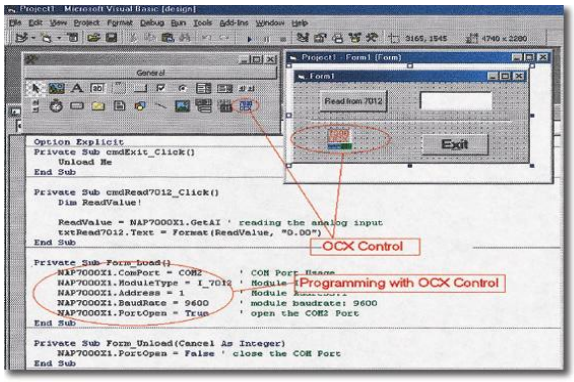
VB Step 2

```
Private Sub cmdAnalogInAll_Click()
    Dim iRet As Integer

    Dim sSendString As String
    Dim sReceiveString As String
    Dim dwCommandBuf(0 To 7) As Long
    Dim fReceiveBuf(0 To 7) As Single

    sSendString = Space(20)
    sReceiveString = Space(80)

    dwCommandBuf(0) = 3          'COM Port = 3
    dwCommandBuf(1) = 1          'Address = 1 (fixed for 8430/8830 )
    dwCommandBuf(2) = &H8017     'Module ID
    dwCommandBuf(3) = 0          'CheckSum disabled
    dwCommandBuf(4) = 1000       'TimeOut = 1000 ms
    dwCommandBuf(5) = 0          'Channel number, Don't care in AnalogInAll
    dwCommandBuf(6) = 0          'String debug disabled
    dwCommandBuf(7) = 0          'Module slot = 0

    iRet = AnalogInAll_8K(dwCommandBuf(0), fReceiveBuf(0), sSendString, sReceiveString)
    If iRet <> 0 Then
        MsgBox "AnalogInAll_8K() error !"
    End If

    txtCh0.Text = fReceiveBuf(0)
    txtCh1.Text = fReceiveBuf(1)
    txtCh2.Text = fReceiveBuf(2)
    txtCh3.Text = fReceiveBuf(3)
    txtCh4.Text = fReceiveBuf(4)
    txtCh5.Text = fReceiveBuf(5)
    txtCh6.Text = fReceiveBuf(6)
    txtCh7.Text = fReceiveBuf(7)
End Sub
```

Step 8: Run the project.



4.4 DCON ActiveX



DCON ActiveX

ActiveX (ocx) component

Supported modules:

i-7000/8000/87K series

(with DCON protocol)

Supported demos:

VB/VC/BCB/Delphi

Supported OS:

Windows 98/NT/2K/XP

File location:

CD:\Napdos\Driver\DCON_ActiveX

4.4.1 Procedure for using the ActiveX

Step 1: Read most basic and important documents

Readme.txt: contains the basic and important information, including:

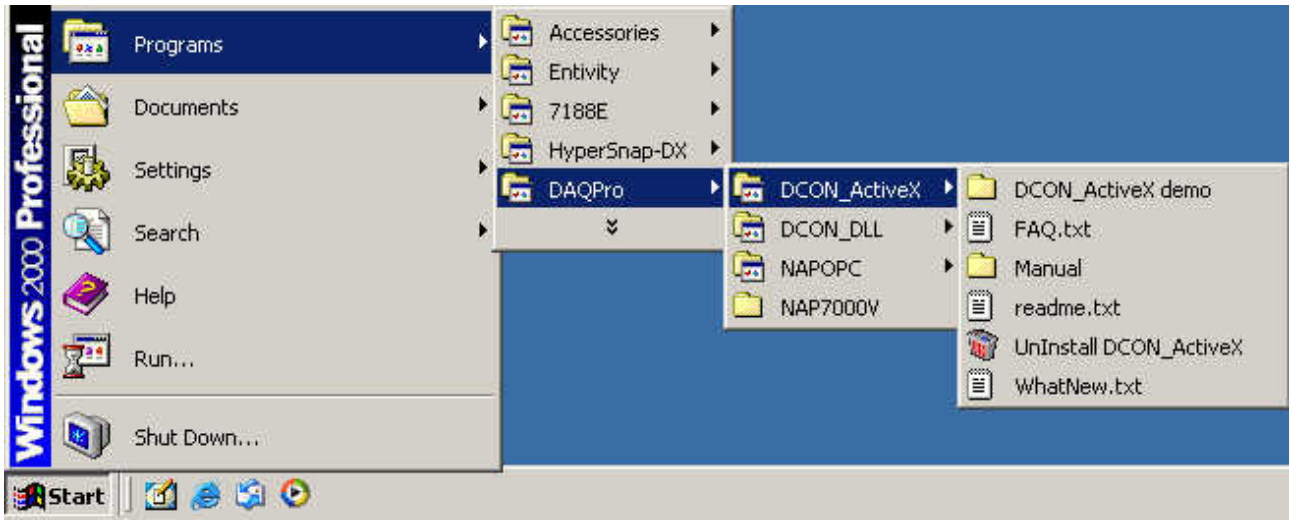
- What is DCON ActiveX
- What files are installed on the PC
- The directory tree installed on the PC
- Demo list

WhatsNew.txt: contains the version/reversion history information, including:

- Bugs fixed
- Demos added or modified
- Updated ActiveX (ocx) details

Step 2: Install the DCON ActiveX by executing:
CD:\Napdos\Driver\DCON_ActiveX\Setup\setup.exe

After installation, all related information can be found below



Step 3: Read the manuals describing how to start

InstallOCX.pdf:
Explains how to install/uninstall the ActiveX (ocx) component in VB/VC/Delphi/BCB

DCON_ActiveX.pdf explains the following details:

- How to include the ActiveX(ocx) in VB/VC/Delphi/BCB
- How to develop a program in VB/VC/Delphi/BCB
- Demo list
- Function descriptions and usage

Step 4: Run the demo programs to test the I/O module and learn the functions

4.4.2 VB Example (Reading an analog input value)

The following is an example of reading analog values from an I-87017 inserted in slot 0 of an 8430/8830.

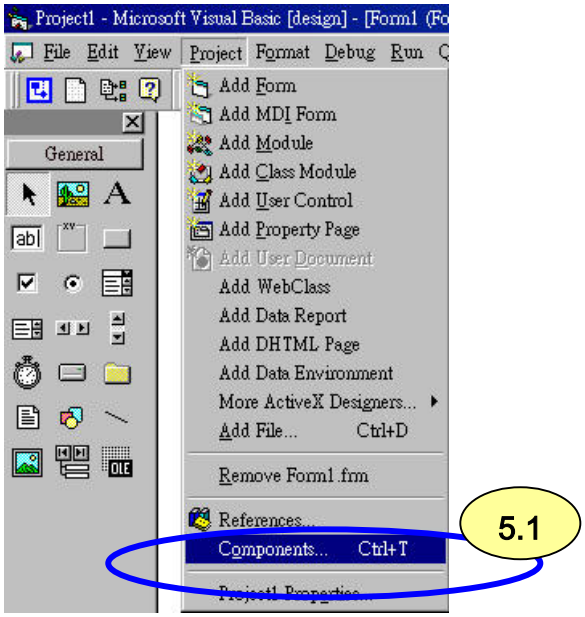
Step 1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

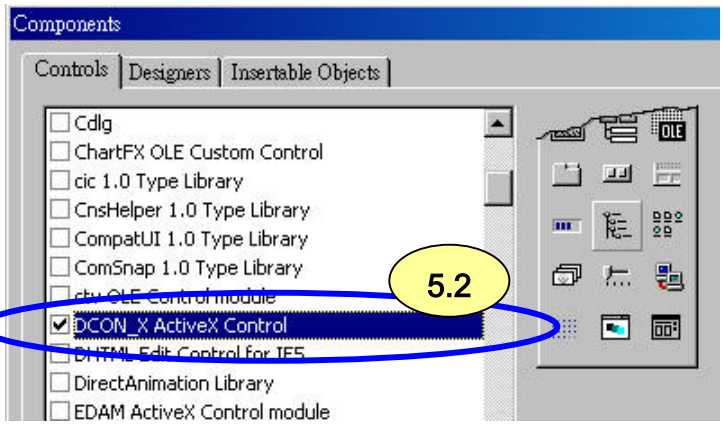
Step 2: Run the VxComm Utility to create a virtual COM port (e.g. COM3) to map the 8430/8830

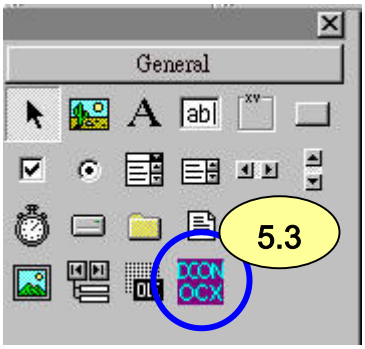
Step 3: Run the DCON Utility to configure the I/O module

Step 4: Run VB and create a new project (.exe project)

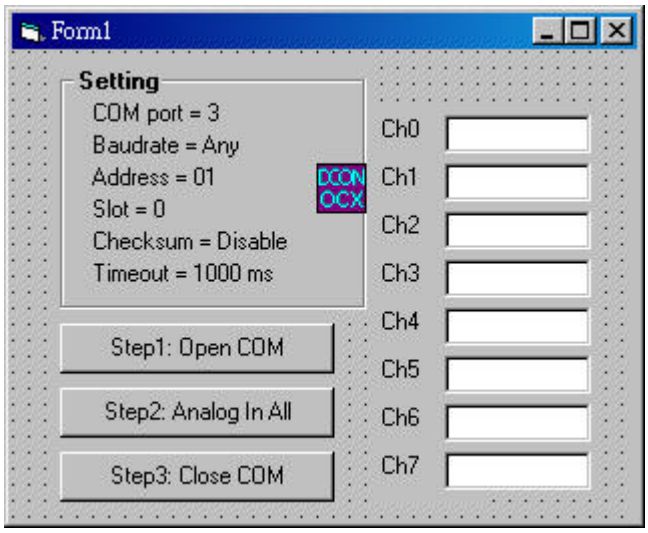
Step 5: Add the ActiveX (ocx) component to the project







Step 6: Arrange all the components on the form



Step 7: Write the program code

VB Step 2

```
Private Sub cmdAnalogInAll_Click()
    Dim fReceiveBuf(0 To 7) As Single

    DCON_X1.ModuleAddress = 1
    DCON_X1.ModuleID = CLng("&H8017")
    DCON_X1.SlotNo = 0
    DCON_X1.CheckSum = False
    DCON_X1.TimeOut = 1000

    DCON_X1.AnalogInAll fReceiveBuf(0)
    If DCON_X1.ErrorCode = 0 Then
        txtCh0.Text = fReceiveBuf(0)
        txtCh1.Text = fReceiveBuf(1)
        txtCh2.Text = fReceiveBuf(2)
        txtCh3.Text = fReceiveBuf(3)
        txtCh4.Text = fReceiveBuf(4)
        txtCh5.Text = fReceiveBuf(5)
        txtCh6.Text = fReceiveBuf(6)
        txtCh7.Text = fReceiveBuf(7)
    Else
        MsgBox "DCON ActiveX error!"
    End If
End Sub
```

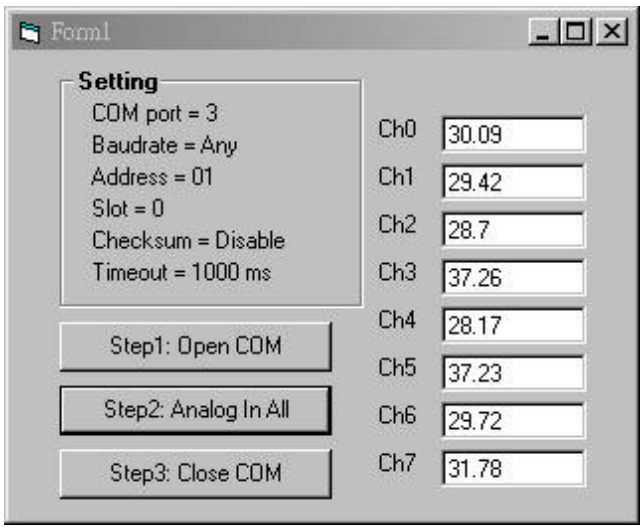
VB Step 3

```
Private Sub cmdCloseCOM_Click()
    DCON_X1.PortOpen = False
End Sub
```

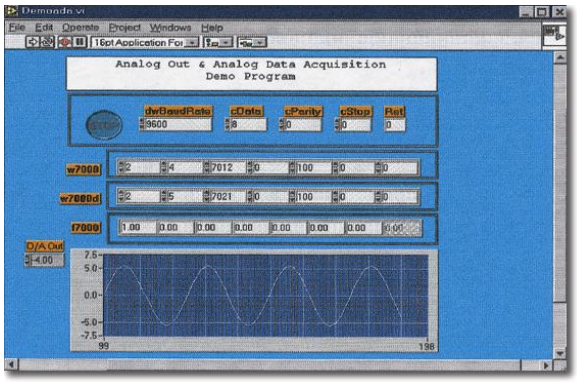
VB Step 1

```
Private Sub cmdOpenCOM_Click()
    DCON_X1.COMPort = 3
    DCON_X1.BaudRate = 9600
    DCON_X1.DataBit = 8
    DCON_X1.ParityBit = 0
    DCON_X1.StopBit = 1
    DCON_X1.PortOpen = True
End Sub
```

Step 8: Run the project



4.5 DCON Labview



DCON Labview

Bundled driver for Labview

Supported modules:

i-7000/8000/87K series

(with DCON protocol)

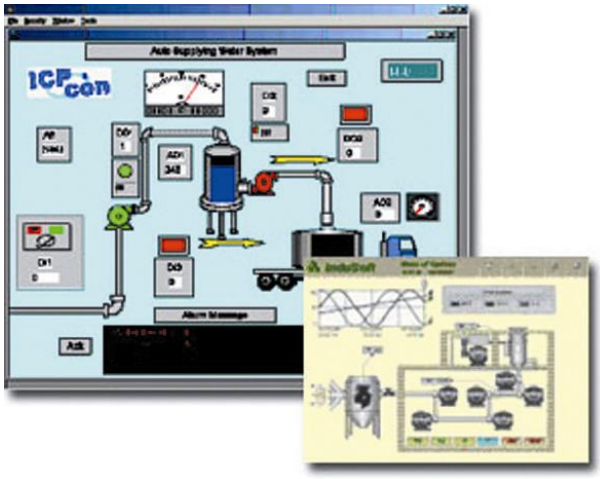
Supported OS:

Windows 98/NT/2K/XP

File location:

CD:\Napdos\Driver\DCON_Labview

4.6 DCON Indusoft



DCON Indusoft

Bundled driver for Indusoft

Supported Module:

i-7000/8000/87K series

(with DCON protocol)

Supported OS:

Windows 98/NT/2K/XP/CE

File location:

CD:\Napdos\Driver\DCON_Indusoft

4.6.1 Procedure for using the Indusoft bundled driver

Step 1: Read the basic and important documents

Readme.txt: contains the basic and important information, including:

- Files on the shipped CD

Reversion.txt: contains the reversion information, including

- Bugs fixed
- New modules supported

Step 2: Install the Indusoft bundled driver by executing
CD:\Napdos\Driver\DCON_Indusoft\Setup\setup.exe

Step 3: Read the manuals describing how to start

The **DCON.pdf** user's manual describes how to use the Indusoft bundled driver

Step 4: Run the demo programs (ICPDriverTest.zip) to test I/O modules and learn the functions

4.6.2 Indusoft Example (Reading an analog input value)

The following is an example of reading analog values from an I-87017 inserted in slot 0 of an 8430/8830.

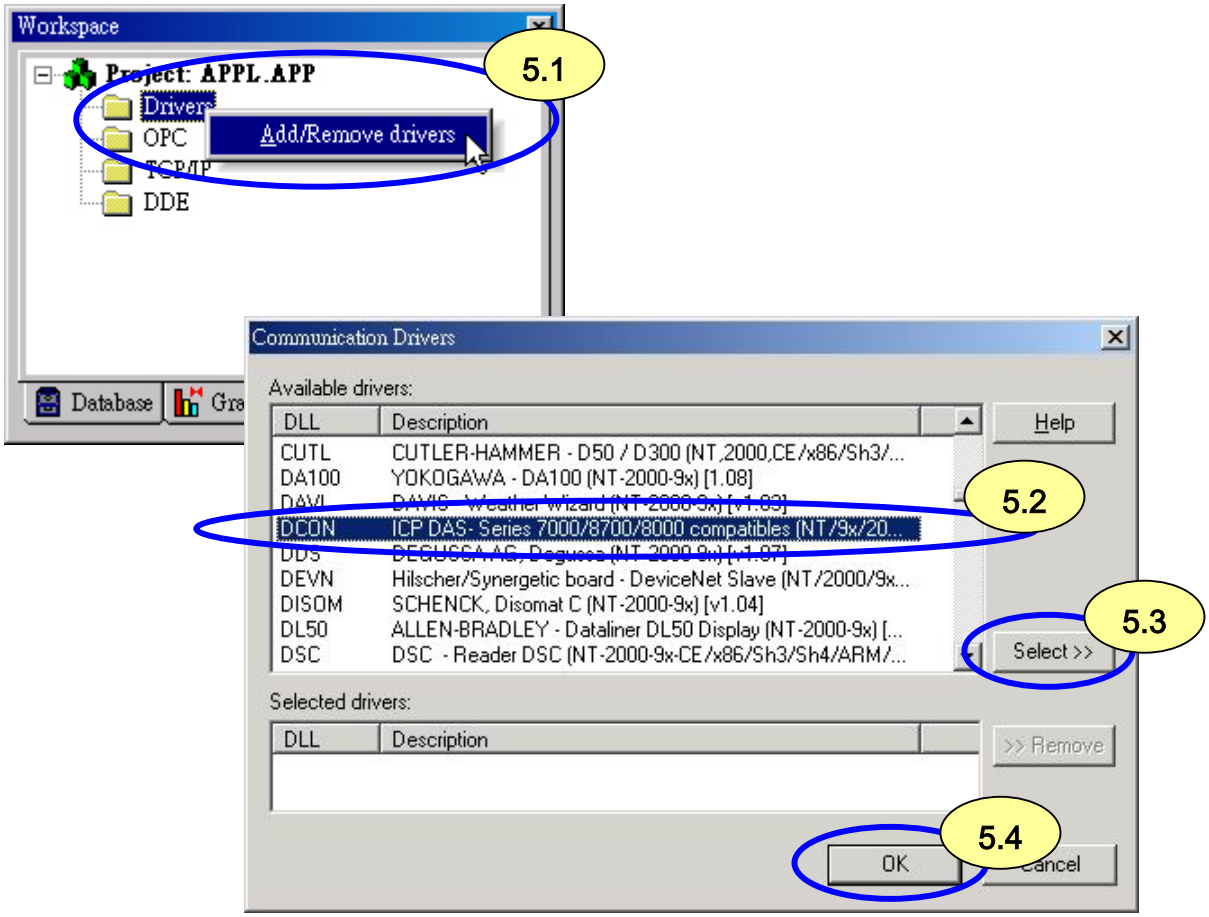
Step 1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

Step 2: Run the VxComm Utility to create a virtual COM port (e.g. COM3) to map the 8430/8830

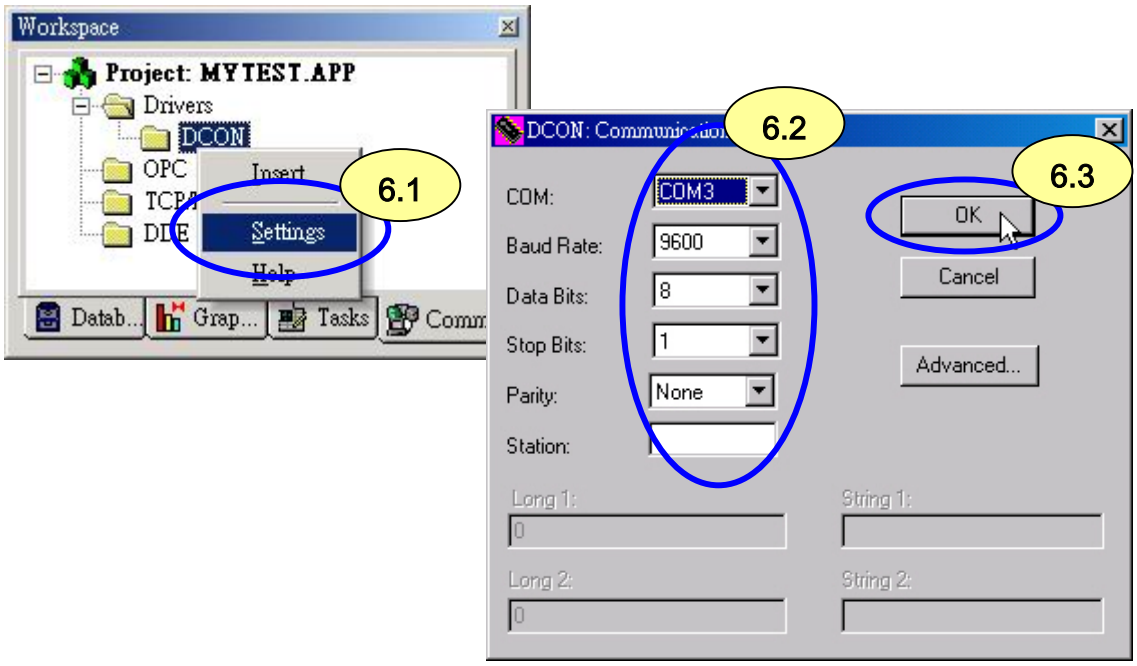
Step 3: Run the DCON Utility to configure the I/O modules

Step 4: Run Indusoft and create a new project

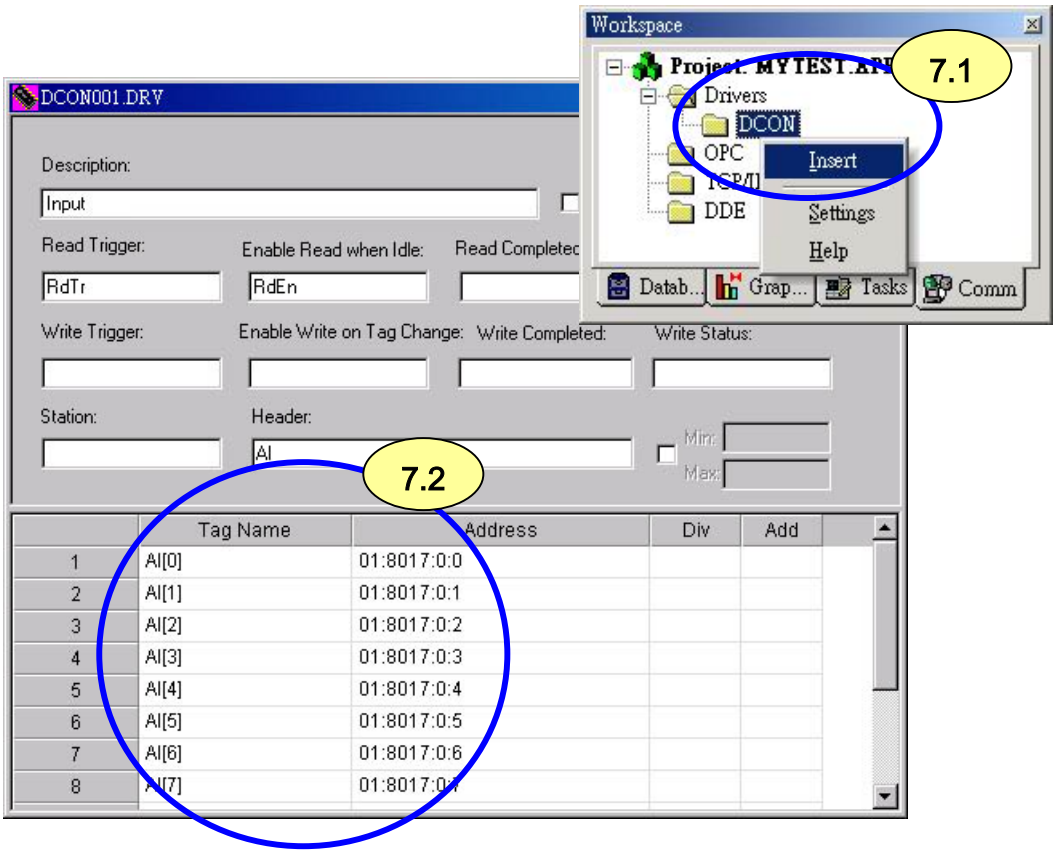
Step 5: Include the DCON driver



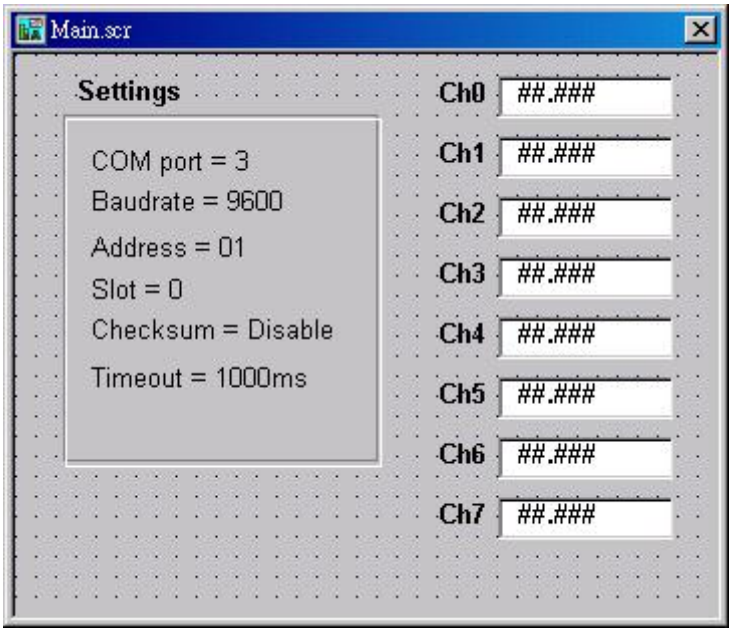
Step 6: Configure the DCON driver



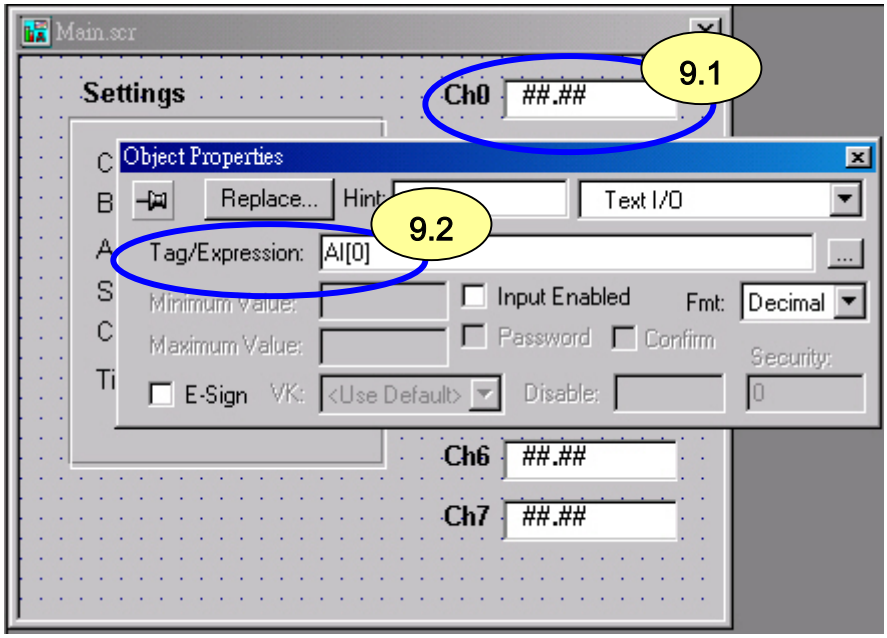
Step7: Insert tags to connect to I/O modules
The address format is [Address : ModuleID : Slot : Channel]



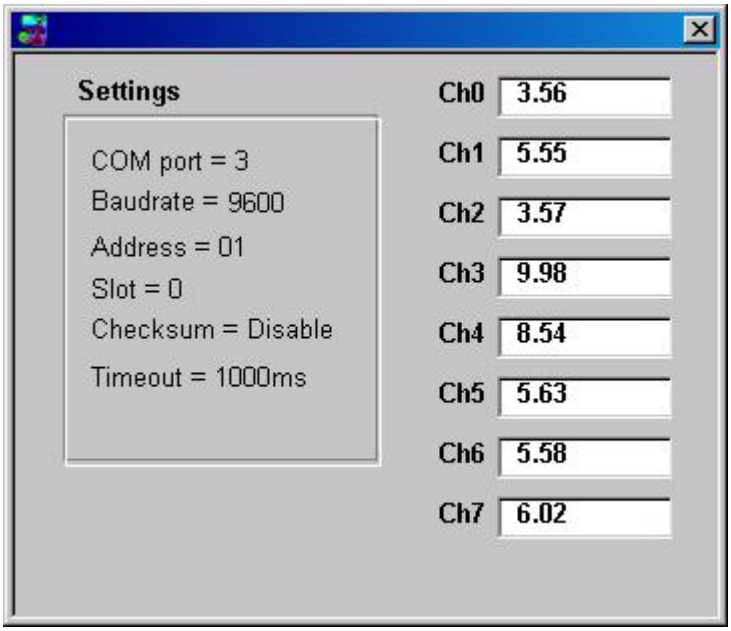
Step8: Arrange all the components on the form



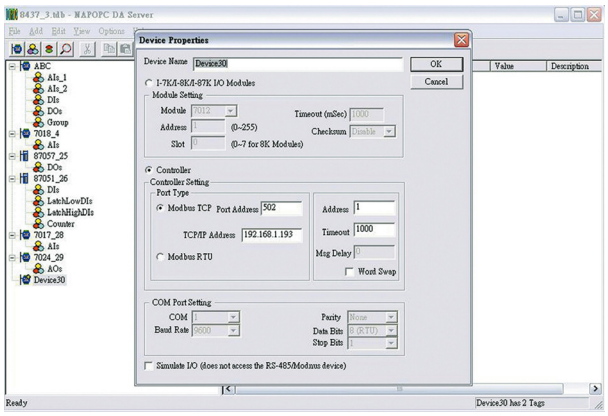
Step9: Double click the text box to assign a tag to it



Step10: Run the project



4.7 NAP OPC Server



NAP OPC server

OPC Server

Supported module:

i-7000/8000/87K series
(with DCON protocol)

Modbus embedded controller

ISaGRAF embedded controller

Supported OS:

Windows 98/NT/2K/XP/CE

File location:

CD:\Napdos\NapOPCSvr

4.7.1 Introduction

OPC (OLE for Process Control) is the first standard resulting from the collaboration of a number of leading worldwide automation suppliers working in cooperation with Microsoft. Originally based on Microsoft's OLE COM (component object model) and DCOM (distributed component object model) technologies, the specification defined a standard set of objects, interfaces and methods for use in process control and manufacturing automation applications to facilitate interoperability. The COM/DCOM technologies provided the framework for software products to be developed. There are now hundreds of OPC Data

Access servers and clients.

4.7.2 Procedure for using the OPC server

Step 1: Read the basic and important documents

Readme.txt: contains the basic and important information, including

- Files on the shipped CD

Reversion.txt: contains the reversion information, including

- Bugs fixed
- New modules supported

Step 2: Install the OPC server by executing
CD:\Napdos\NapOPCSvr\NapOPCServer.exe
Note: If there is an older version of Nap OPC Server installed on the PC, It must be uninstalled before installing the new version.

Step 3: Read the manuals describing how to start

The **NapOPCSvr.pdf** is the user's manual describing how to use the OPC server

4.7.3 OPC Server Example (Reading an analog input value)

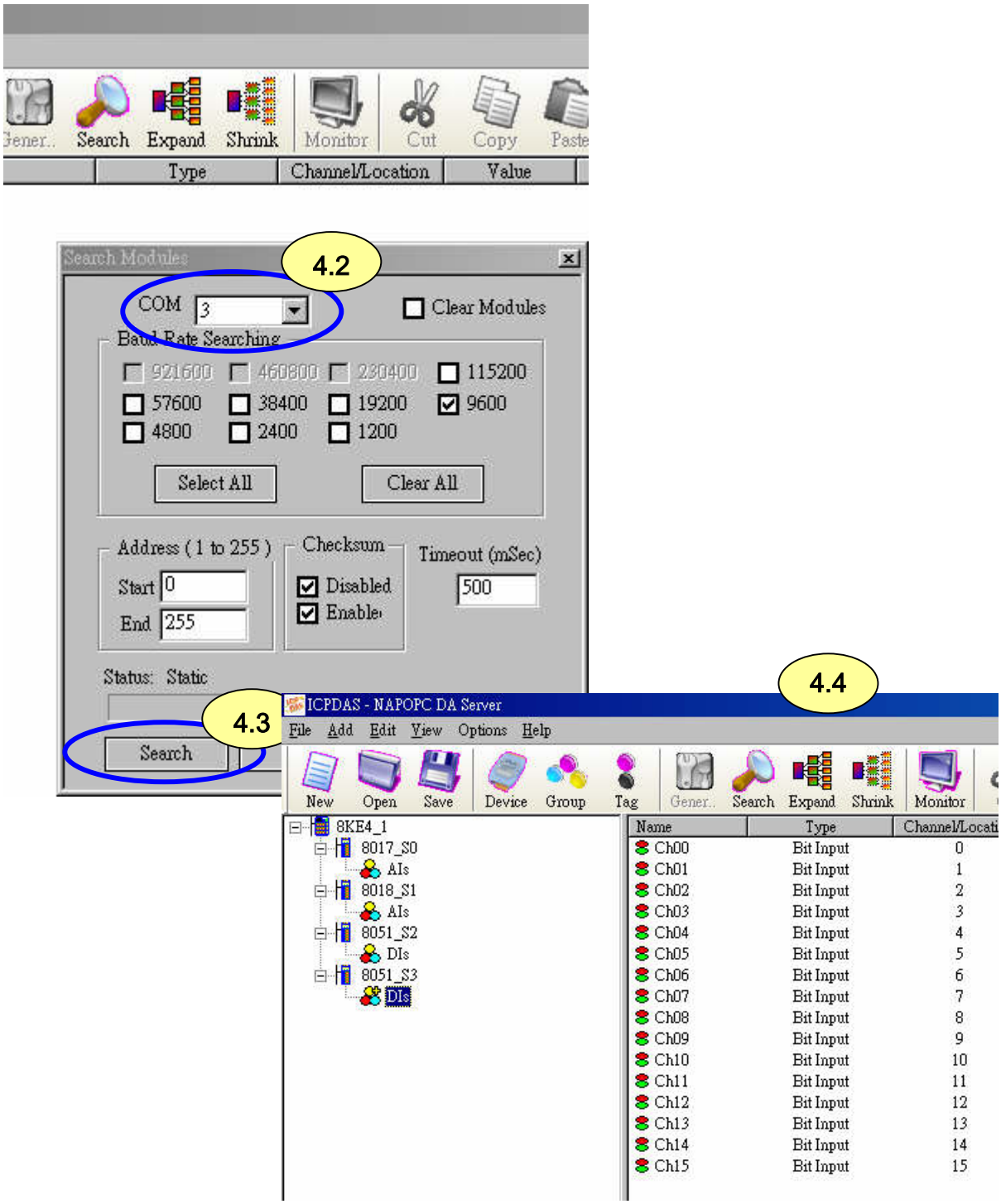
The following is an example of reading analog values from an I-87017 inserted in slot 0 of an 8430/8830.

Step 1: Wire the 8430/8830 and configure its network settings (IP, Mask, Gateway)

Step 2: Run the VxComm Utility to create a virtual COM port (e.g. COM3) to map the 8430/8830

Step 3: Run the DCON Utility to configure the I/O modules

Step 4: Run the OPC server to search for I/O modules on COM3



Step 5: Save the configuration and close the OPC Server

Step 6: Run SCADA software to connect to the OPC Server

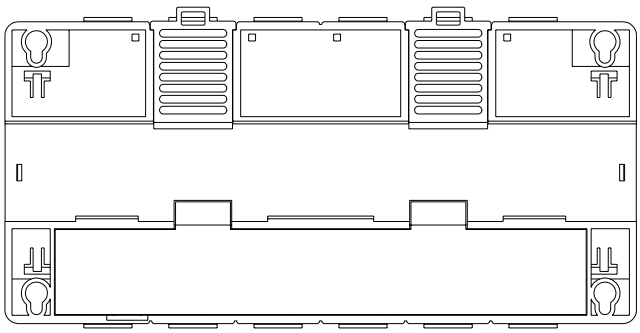
The OPC Server user's manual lists the procedures for the following SCADA software:

- **Labview**
- **National**
- **WIZCON**
- **iFix**
- **Indusoft**
- **Citect**

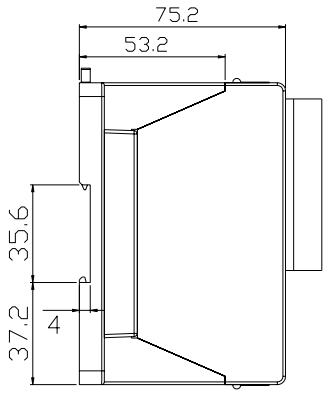
Please refer to "Chapter 4 Connecting to the OPC Server" for more details.

Appendix A: Dimensions

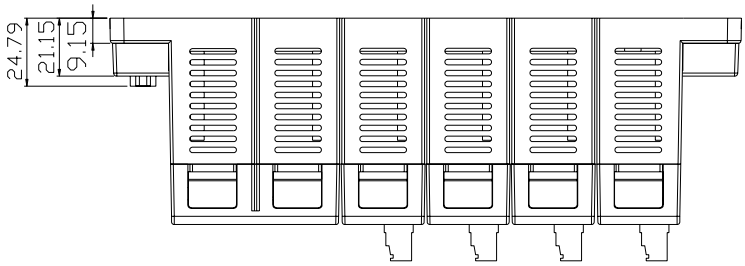
i-8430 :



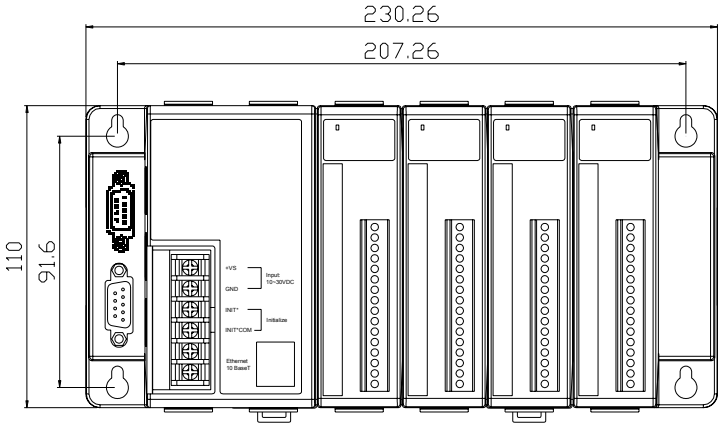
Back View



Side View

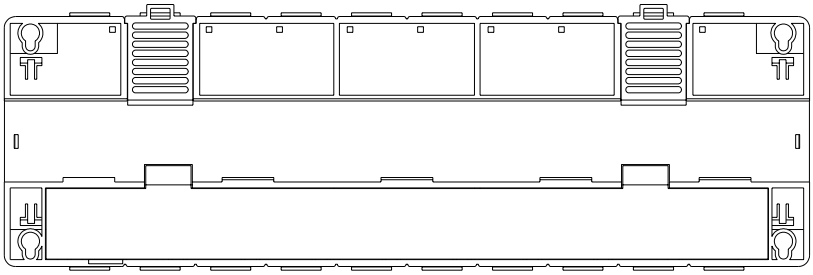


Top View

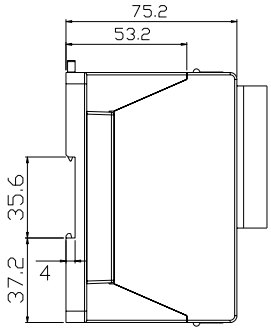


Front View

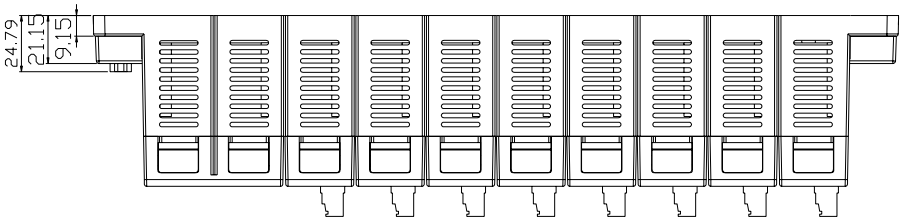
i-8830:



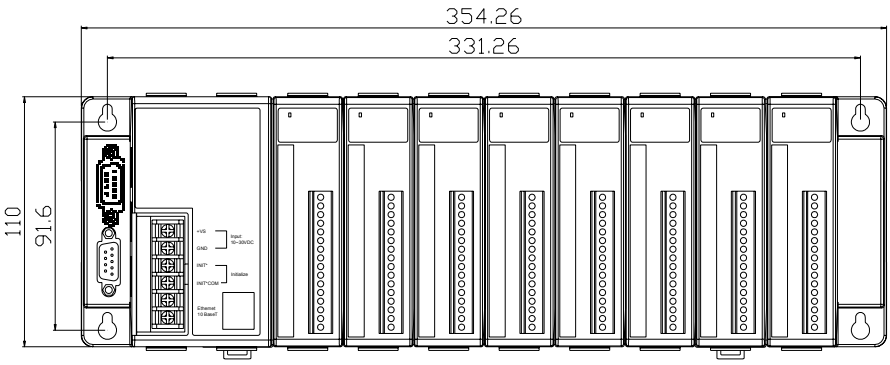
Back View



Side View

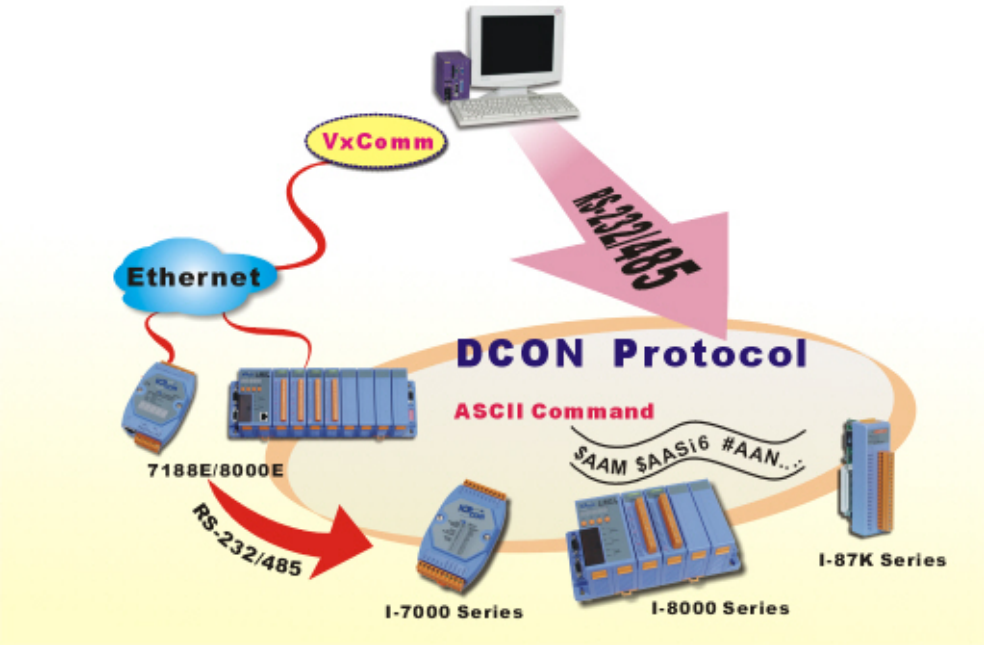


Top View



Front View

Appendix B: DCON protocol



The DCON protocol is a request/reply communication protocol for the I-7000/8000/87K series I/O modules, and uses a simple ASCII format such as $AAN, $AASi6, #AAN, #AASiCj,..., etc. The protocol format is defined as follows:

Basic Command Format

Command Format:

Leading Character	Module Address	Command	[CHKSUM]	CR

Response Format:

Leading Character	[Module Address]	[Data]	[CHKSUM]	CR

The Leading Character can include '@', '#', '$', '%', '~', '!'

Checksum A 2-character checksum and is present when the checksum option is enabled.

Address 0x00 ~ 0xFF

CR Carriage return (0x0D)

Command Set

The full DCON protocol command sets for i-8000 series' can be found in

CD:\Napdos\DCON\IO_Module\

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/dcon/io_module/

Frequently used Command table reference:

Command	Command Description
$AAM	Reads the Module Name
$AAF	Reads the Firmware Version
#AASi	Reads the analog input or counter / frequency values for all channels of a specified slot
#AASiCj	Reads the analog input or counter/frequency module data from specified slot and the specified channel in the I-8000 unit.
#AASiCj(data)	Sets the analog voltage output module data from the specified slot and channel in the I-8000 unit. The data format is in engineering units only.
#AASi6	Read Digital input and output status at specified slot
#AASi00(data)	Sets the multiple Digital output of a specified slot
# AASiBjDS	Sets the single Digital output of a specified slot

#AASi

Command	#AASi	
Description	Reads the analog input or counter/frequency module data for all channels from specified slot in the I-8000 unit.	
Syntax	#AASi[CHK](cr)	
	#	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 system ,ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3 (4 slots) or i = 0 to 7 (8 slots)
	[CHK]	2-characters of checksum
	(cr)	Character Return(0x0D) for denote the end of command
	Valid Command	>(data)[chk](cr)
	Invalid Command	?AA[CHK](cr)
	Syntax error or communication error may get no response.	
	>	A delimiter for valid command
	?	A delimiter for invalid command
	AA	A 2-character HEX module address
	(data)	A return string from the RTD input module in engineering mode.
	[CHK]	A 2-character checksum
	(cr)	Carriage Return(0x0D) to denote the end of response
Example	Command	*#01S3*
	Response	*>+2.1234+2.1234 +2.1234 +2.1234 (cr)*
	Description	The data read from analog data input module i-87013 (4 channels analog input module) in slot 3 of the I-8000 system at address 01h is *+2.1234+2.1234 +2.1234 +2.1234*.
Note:	i-87013 ➔ 4-Channel RTD Analog Input Module i-8017H ➔ Fast 8-Channel mV/V/mA Analog Input Module i-87017 ➔ 8-Channel mV/V/mA Analog Input Module i-87018 ➔ 8-Channel mV/V/mA and Thermocouple Analog Input Module i-8080 ➔ 8-Channel Counter/Frequency Module	

#AASiCj

Command	#AASiCj	
Description	Reads the analog input or counter/frequency module data from specified slot and the specified channel in the I-8000 unit.	
Syntax	#AASiCj[CHK](cr)	
	#	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 unit, ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3 (4 slots) or i = 0 to 7 (8 slots)
	Cj	specified channel number. i-87013 ➔ j = 0 to 3 i-8017H ➔ j = 0 to 7 i-87017 ➔ j = 0 to 7 i-87018 ➔ j = 0 to 7 i-8080 ➔ j = 0 to 7
	[CHK]	The 2-character of Checksum
	(cr)	Carriage Return(0x0D) for denote the end of the command
	Valid Command	>(data)[chk](cr)
	Invalid Command	?AA[CHK](cr)
	Any syntax or communication error may receive no response.	
	>	A delimiter for valid command
	?	A delimiter for invalid command
	AA	A 2-character HEX module address
	(data)	A return string from RTD input module in engineering mode.
	[CHK]	A 2-character checksum
	(cr)	Carriage Return (0x0D) to denote the end of the response
Example	Command	*#01S3C0*
	Response	*>+2.1234(cr)*
	Description	The data read from the analog data input module in slot 3 and channel 0 of the I-8000 unit at address 01h is +2.1234.
Notes:	i-87013 ➔ 4-Channel RTD Analog Input Module i-8017H ➔ Fast 8-Channel mV/V/mA Analog Input Module i-87017 ➔ 8-Channel mV/V/mA Analog Input Module i-87018 ➔ 8-Channel mV/V/mA and Thermocouple Analog Input Module i-8080 ➔ 8-Channel Counter/Frequency Module	

#AASiCj

Command	#AASiCj(data)	
Description	Sets the analog voltage output module data from the specified slot and channel in the I-8000 unit. The data format is in engineering units only.	
Syntax	#AASiCj(data)[CHK](cr)	
	#	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 unit ,ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3(4 slots) or i = 0 to 7(8 slots)
	Cj	The specified channel number. i-87022 ➔ j = 0 to 1 i-87024 ➔ j = 0 to 3 i-87026 ➔ j = 0 to 3 i-8024 ➔ j = 0 to 3
	(data)	A decimal value, always engineer unit
	[CHK]	A 2-character checksum
	(cr)	Carriage Return (0x0D) to denote the end of command
	Valid Command	> [chk](cr)
	Invalid Command	?AA[CHK](cr)
	Any syntax or communication error may receive no response.	
	>	A delimiter for valid command
	?	A delimiter for invalid command
	AA	A 2-character HEX module address
	[CHK]	A 2-character of checksum
	(cr)	Carriage Return (0x0D) to denote the end of response
Example 1:	Command	*#01S3C1+09.000*
	Response	*> (cr)*
	Description	This example sends the positive value +9.000V to the Analog Data output Module in slot 3 and channel 1 of the I-8000 unit at address 01h. The response indicates the command is valid
Example 2:	Command	*#01S3C1-05.000*
	Response	*> (cr)*
	Description	This example sends the negative value -5.000V to the Analog Data output Module in slot 3 and channel 1 of the I-8000 unit at address 01h. The response indicates the command is valid

$AASi6

Command	$AASi6	
Description	Read back the Digital Output module value and read the Digital Input module value of a specified slot in the I-8000 unit.	
Syntax	$AASi6[CHK](cr)	
	$	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 unit, ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3 (4 slots) or i = 0 to 7 (8 slots)
	6	A Command to read the data
	[CHK]	A 2-character checksum
	(cr)	Carriage Return (0x0D) to denote the end of command
	Valid Command	!0D0E00[CHK](cr) for 8-bit DIO modules !DD0000[CHK](cr) for 8-bit (or less than 8 bits) DO modules !EE0000[CHK](cr) for 8-bit (or less than 8 bits) DI modules !DDEE00[CHK](cr) for 16-bit DIO modules !DDDD00[CHK](cr) for 16-bit DO modules !EEEE00[CHK](cr) for 16-bit DI modules !DDDDEEEE[CHK](cr) for 32-bit DIO modules !DDDDDDDD[CHK](cr) for 32-bit DO modules !EEEEEEEE[CHK](cr) for 32-bit DI modules
	Invalid Command	?AA[CHK](cr)
	Any syntax or communication error may receive no response.	
	!	A delimiter for valid command
	?	A delimiter for invalid command
	D	4-bit output value (0~Fh)
	E	4-bit input value (0~Fh)
	DD	8-bit output value (00~FFh)
	EE	8-bit input value (00~FFh)
	DDDD	16-bit output value (0000~FFFFh)
	EEEE	16-bit input value (0000~FFFFh)
	DDDDDDDD	32-bit output value (00000000~FFFFFFFFh)
	EEEEEEEE	32 bit input value (00000000~FFFFFFFFh)
	[CHK]	A 2-character checksum
	(cr)	Carriage Return (0x0D) to denote the end of response
Example	Command	$01S16
	Response	!0155AA00
	Description	The example reads the digital I/O module value from slot 1 of the I-8000 unit at address 01h. The second 2-character value 55h (01010101) indicate the I/O module channels 1,3,5,7 are ON and channels 0,2,4,6 are OFF.

AASi00(data) For multiple channels DO output

Command	#AASi00(data)	
Description	Sends the value to the digital output module for multiple channels output of a specified slot in the I-8000 unit	
Syntax	#AASi00(data)[CHK](cr)	
	$	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 unit ,ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3(4 slots) or i = 0 to 7(8 slots)
	00	00 that for multiple channels' DO output
	(data)	A 2-character or 4-character HEX for digital output value. For output from all channels, the data will be 2-character HEX for channel count is less than or equal to 8 bits, 4-character for channel count is 16 bits and greater than 8 bits. The data bit is corresponds to the output module channel.
	[CHK]	2-characters of Checksum
	(cr)	Carriage Return (0x0D) to denote the end of the command
	Valid Command	>[chk](cr)
	Invalid Command	?AA[CHK](cr)
	Any syntax or communication error may receive no response.	
	>	A delimiter for valid command
	?	A delimiter for invalid command
	[CHK]	A 2-character of checksum
	(cr)	Carriage Return (0x0D) to denote the end of the response
Note	If any channel of digital output module (*1) is configured for an analog input alarms then this command has no effect on the specified channel. The channel is always used for analog input alarms and can not be configured again unless it is disconnected. Refer to: Analog Input Alarm (*1) For digital output modules not support analog input alarm are : i-8041, i-87041, i-87042, i-8050	

Example	Command	*#01S30042*
	Response	*>(cr)*
	Description	This example is for an 8-channel digital output module. The Digital output Module in slot 3 and channel 2 and channel 6 of the I-8000 unit at address 01h will be set to ON. This example is only for output modules where the channel number is less than or equal to 8.
	Command	*#01S300AA55(cr)*
	Response	*>(cr)*
	Description	This example is for a 16-channel digital output module. The Digital output Module in slot 3 and channels 0,2,4,6 (55h), 9, 11, 13, 15 (AAh) of the I-8000 unit at address 01h will be set to ON. Channels 1, 3, 5, 7, 8, 10, 12, 14 are set to OFF. This example just for output module channel number is greater than 8 and less then or equal to 16.

AASiBjDS For single channel DO output

Command	#AAS**i**BjDs	
Description	This command sends the value to the digital output module of the specified channel and slot of the I-8000 unit. This command is only for output modules which the channel number is less than or equal to 16.	
Syntax	#AASi1BDs[CHK](cr)	
	$	A delimiter character
	AA	A 2-character HEX module address for the specified I-8000 unit ,ranging from 01 to FFh
	Si	The specified slot number. i = 0 to 3(4 slots) or i = 0 to 7(8 slots)
	Bj	The channel to be set will contain two characters.The first character 'B' is always be number 1, and the second character 'j' indicates the channel will be set and ranging from 0 to F.
	Ds	For single channel output the data will contain two character. The first character 'D' is always 0. The second character is ether 0 or 1. 0 => OFF, 1 => ON.
	[CHK]	2-characters of Checksum
	(cr)	Carriage Return (0x0D) to denote the end of the command
	Valid Command	>[chk](cr)
	Invalid Command	?AA[CHK](cr)
	Any syntax or communication error may receive no response.	
	>	A delimiter for valid command
	?	A delimiter for invalid command
	[CHK]	A 2-character of checksum
	(cr)	Carriage Return (0x0D) to denote the end of the response
Note	If any channel of digital output module (*1) is configured for an analog input alarms then this command has no effect on the specified channel. The channel is always used for analog input alarms and can not be configured again unless it is disconnected. Refer to: Analog Input Alarm (*1) For digital output modules not support analog input alarm are : i-8041, i-87041, i-87042, i-8050	
Example	Command	*#01S31C01*
	Response	*>(cr)*
	Description	This example is for a single channel. The Digital output Module in slot 3 and channel 12 (0Ch) of the I-8000 unit at address 01h will be set to ON. This example is only for output modules which the channel number is less than or equal to 16.
	Command	*#01S31A00(cr)*
	Response	*>(cr)*

	Description	This example is for a single channel. The Digital output Module in slot 3 and channel 10 (0Ah) of the I-8000 unit at address 01h will be set to OFF. This example is only for output modules where the channel number is less than or equal to 16.

The table below show to use command #AASiBjs to set 16-channel digital output module of the specified channel of slot 3 of the I-8000 unit.

Command	Channel Status	Command	Channel Status
#01S31000	Set the Channel 0 DO OFF	#01S31001	Set the Channel 0 DO ON
#01S31100	Set the Channel 1 DO OFF	#01S31101	Set the Channel 1 DO ON
#01S31200	Set the Channel 2 DO OFF	#01S31201	Set the Channel 2 DO ON
#01S31300	Set the Channel 3 DO OFF	#01S31301	Set the Channel 3 DO ON
#01S31400	Set the Channel 4 DO OFF	#01S31401	Set the Channel 4 DO ON
#01S31500	Set the Channel 5 DO OFF	#01S31501	Set the Channel 5 DO ON
#01S31600	Set the Channel 6 DO OFF	#01S31601	Set the Channel 6 DO ON
#01S31700	Set the Channel 7 DO OFF	#01S31701	Set the Channel 7 DO ON
#01S31800	Set the Channel 8 DO OFF	#01S31801	Set the Channel 8 DO ON
#01S31900	Set the Channel 9 DO OFF	#01S31901	Set the Channel 9 DO ON
#01S31A00	Set the Channel 10 DO OFF	#01S31A01	Set the Channel 10 DO ON
#01S31B00	Set the Channel 11 DO OFF	#01S31B01	Set the Channel 11 DO ON
#01S31C00	Set the Channel 12 DO OFF	#01S31C01	Set the Channel 12 DO ON
#01S31D00	Set the Channel 13 DO OFF	#01S31D01	Set the Channel 13 DO ON

#01S31E00	Set the Channel 14 DO OFF	#01S31E01	Set the Channel 14 DO ON
#01S31F00	Set the Channel 15 DO OFF	#01S31F01	Set the Channel 15 DO ON

Hardware interface

The hardware interface used to access the I-7000/8000/87K series I/O modules can be divided into the following:

- **RS-232:** I-8000 MCU with R232_nnn.exe (or 8K232.exe) firmware.
  Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps.
  Data format is: 1 start bit, 8 data bits, non-parity, 1 stop bit

- **RS-485:** I-7000/87K series I/O modules and I-8000 MCU with R485_nnn.exe (or 8K485.exe) firmware
  Baud Rate: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps.
  Data format is: 1 start bit, 8 data bits, non-parity, 1 stop bit

- **Ethernet:** I-8000E MCU with E10M_nnn.exe (or 8KE10.exe) firmware
  Speed: 10Mbps

Even though the I-7000/87K series I/O modules are not equipped with an Ethernet interface, by using the I-7188E/8000E in connection with the VxComm technique, they can still be accessed via the Ethernet.

Note:

1. I-8000 MCU includes 8410, 8411, 8810, 8811, 8430,8431, 8830, 8831, 8KE4, 8KE8.
2. 8000E means an I-8000 MCU equipped with an Ethernet port, such as 8430, 8431, 8830, 8831, 8KE4, 8KE8.
3. Both the I-8000 and I-87K series I/O modules can be inserted into the I-8000 MCU simultaneously.
4. When the I-87K series I/O module is inserted into the I-8000 MCU, it uses the same commands as the I-8000 series I/O modules .
5. The 87K series expansion unit series includes 87K4, 87K5, 87K8, 87K9.

6. The I-87K series I/O modules use different commands when they are inserted into the I-8000 MCU and the I-87K expansion unit.

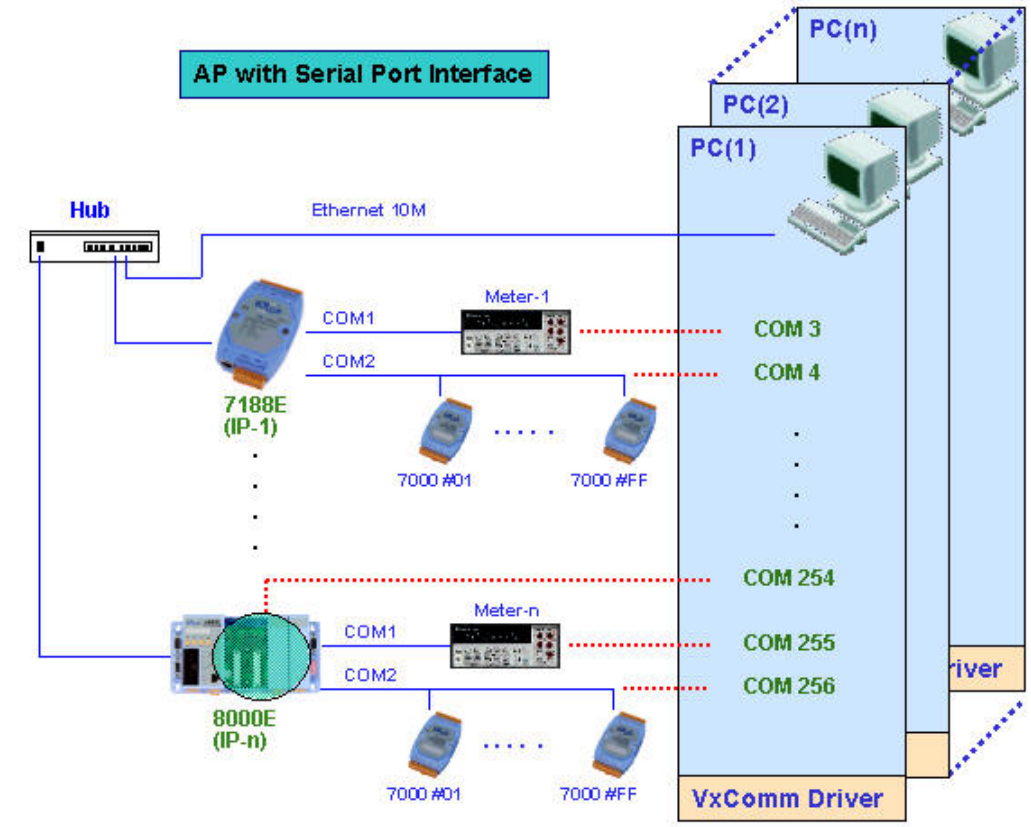
Appendix C: VxComm technique

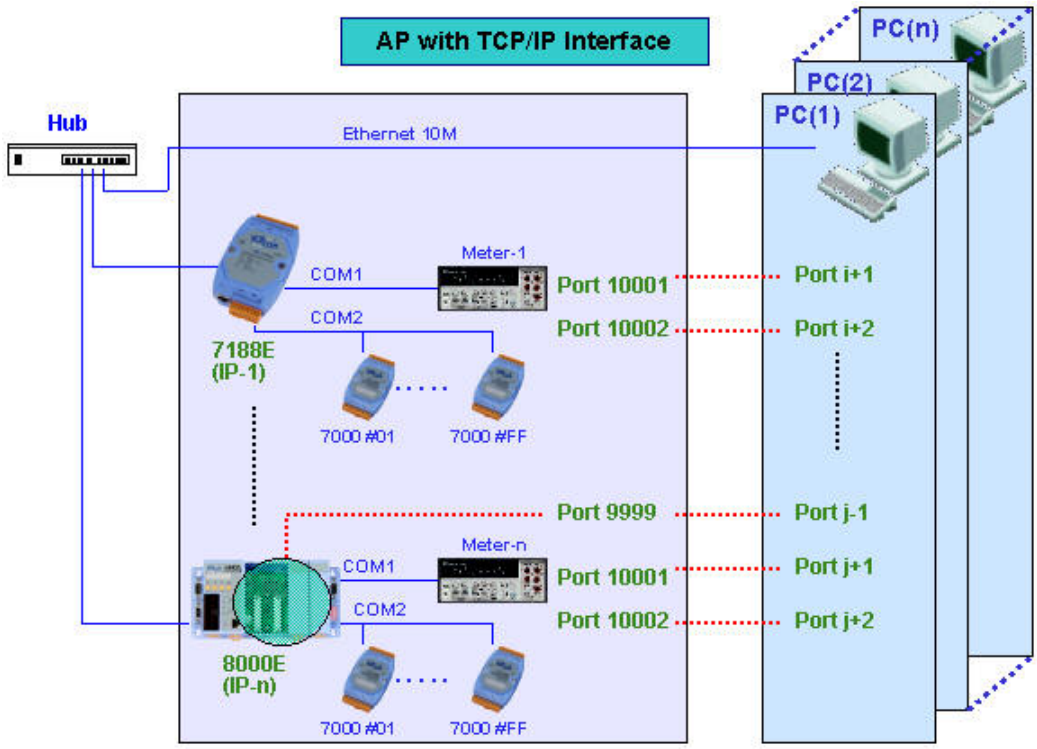
VxComm (“Virtual Communication Port”) is a technique that allows access to remote I/O slots or RS-232 ports. There are two types of software interfaces that can be used to access remote I/O modules and the COM ports of the 7188E/8000E series the first is serial port interface and the second is the TCP/IP interface. For the serial port interface, we provide a VxComm driver for Windows OS. It is used to create virtual COM ports to map to I/O modules and COM ports of the 7188E and 8000E. After creating virtual COM ports, you can easily upgrade serial devices to with Ethernet communication ability and the original software only need to link to a virtual COM port. It doesn’t need any source code modification.

Comparison of using **Virtual COM Port** and **TCP Port** to develop Ethernet application.

	Use **Virtual COM Port** interface	Use **TCP Port** interface
Programming method	Program has to Send and Receive command via COM Port	Program has to Send and receive command via TCP Port
Extra Driver	Need to install VxComm driver on PC	No
Platform	Windows 98 /NT /2000 /XP	All platforms
SDK provided	DLL, ActiveX, LabView bundle driver, InduSoft bundle driver, OPC driver	No ,program has to use DCON Protocol directly to communicate with I/O modlues

THE TWO APPLICATION ARCHITECTURES ARE SHOWN AS BELOW:



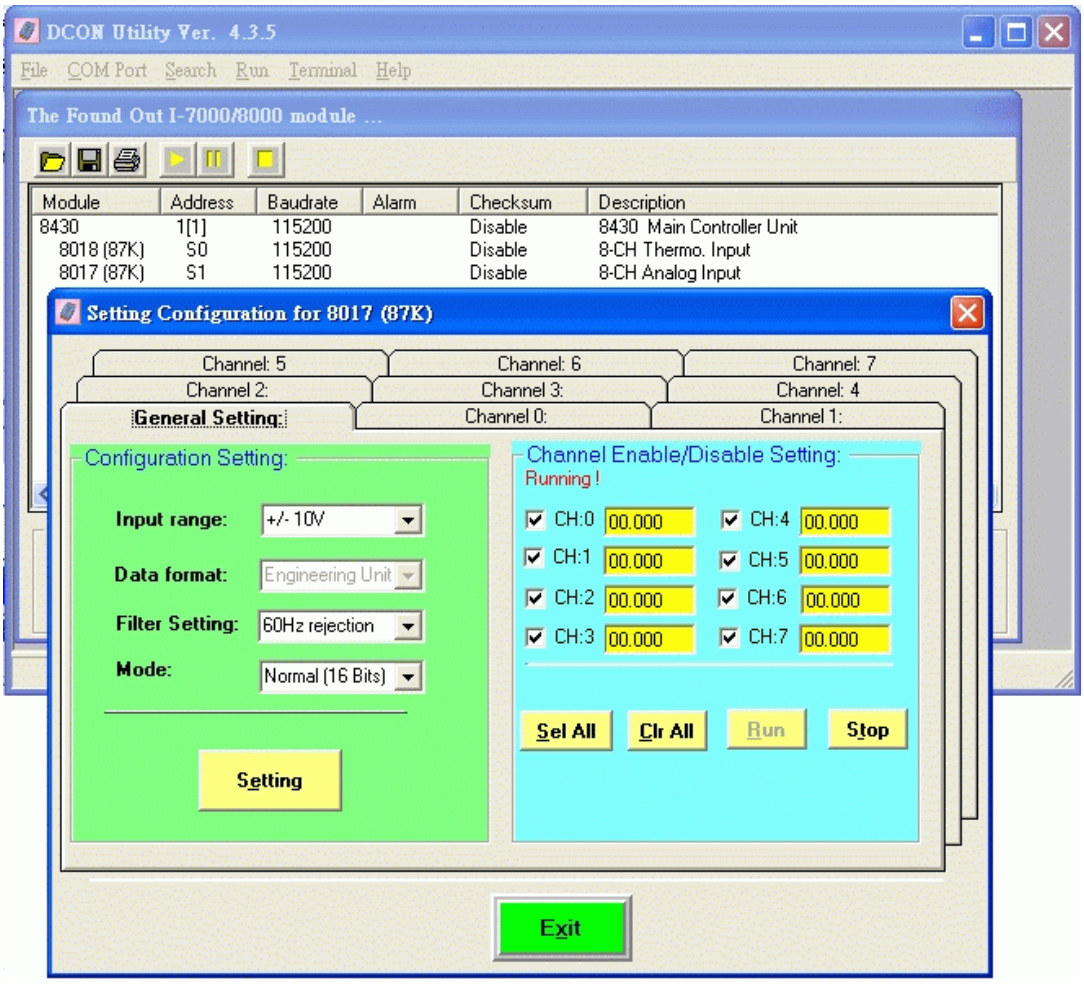


Appendix D: i-8K and i-87K series I/O modules

The DCON firmware (8K232.exe, 8K485.exe and 8KE10.exe) supports both 8K and 87K series I/O modules. The two series I/O modules can be plug in same I-8000 MCU. The modules for DI, DO, DIO, AI, AO and Counter/Frequency purpose are supported. Other modules such as multi-serial port (8112, 8144, 8142, 8144), MMC(8073), motion (8090, 8091) are not supported. The file in the shipped CD lists details.

CD:\Napdos\Driver\DCON_Utility\DCON_Utility_Module_List.htm

The DCON firmware only accepts 4 digits numbers. Thus both 8K and 87K series are recognized as 4 digits numbers. When using the DCON Utility to search I/O modules, the screen shown as following:



The differences between I-8000 and I-87K series I/O modules are

Item	i-8000 series	i-87K series
Microprocessor	No	Yes (8051)
Communication interface	PARALLEL BUS (NOTE1)	Serial bus (Note2)
Communication speed	FAST	Slow
DI latched function	No	Yes
Counter input (for digital input module)	No	Yes (100 Hz)
Power on value	Yes (Note3)	Yes
Safe value	Yes (Note3)	Yes
Host watchdog	Yes	Yes
Module watchdog	No	Yes
Programmable slew-rate for AO module	No	Yes

Note:

1. The 8000 series and 87K I/O modules can both be connected into the same i-8000 MCU, for there are two types of buses on i-8000 series main-board. Through the parallel bus, the CPU can communicate with I/O modules very fast. For digital I/O modules, the communication time takes less than 0.1ms. For analog I/O modules, it depends on the modules. For example, I-8017H's scan rate is 50K samples per second and I-8024's throughput is 2100 samples per second.

2. Through the serial bus (RS-485), the communication speed is 115200 bps Maximum. The communication time depends on the command and response length (bytes). Normally, for digital I/O modules, one module takes less then 1 ms; for analog I/O modules, one sample takes less than 2 ms.

3. The hardware design of the I-8000 series I/O modules doesn't have the power on value and safe value. Running the DCON firmware on the I-8000 MCU, they can have the functions.

Appendix E: Updating MiniOS7 image and firmware

In following situations, we release the new version MiniOS7 image and firmware.

- New I/O modules supported
- New functions added
- Bugs fixed

The tool to update MiniOS7 image and firmware is MiniOS7 Utility.

File location of MiniOS7 Utility
CD:\Napdos\MiniOS7\Utility\MiniOS7_Utility\MiniOS7_Utility.exe or
ftp://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/minios7/utility/minios7_utility/

E.1 Access the controller

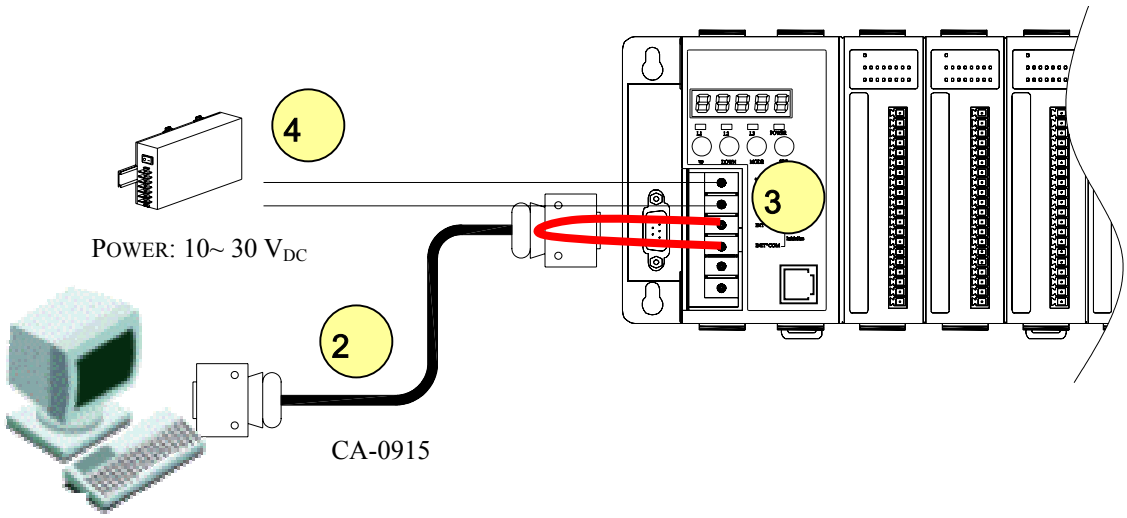
Please follow the steps to do the updating procedure.

Step1: Install MiniOS7 Utility

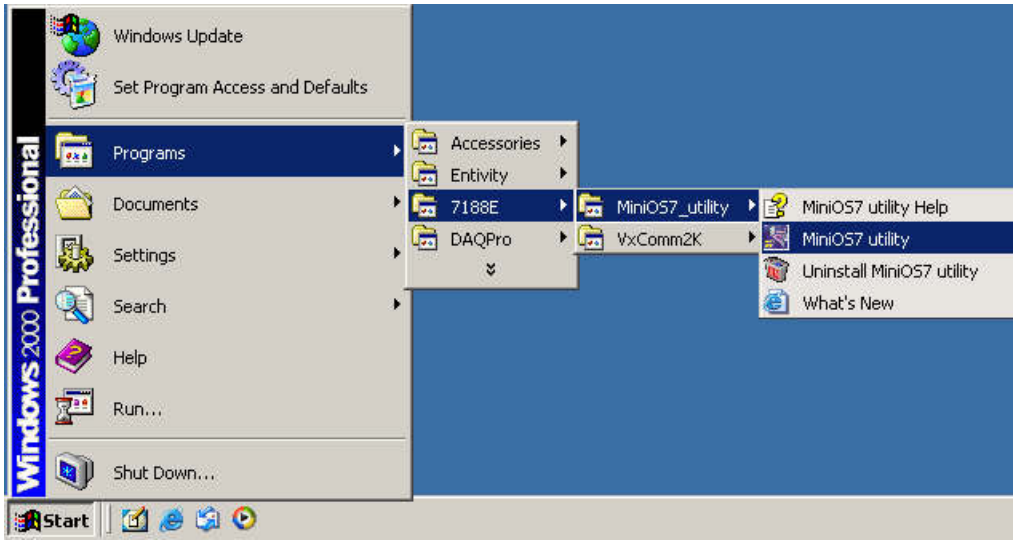
Step2: Use CA-0915 to connect 8430/8830 to COM1/2 of the host PC.

Step3: Short Init* and Init*COM.

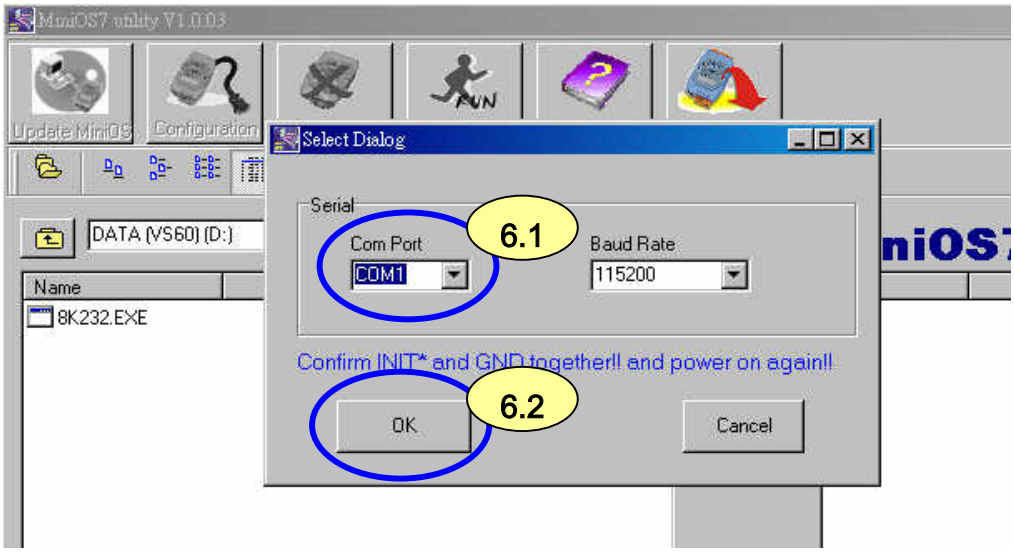
Step4: Power off and then power on the 8430/8830. The CPU doesn't run the autoexec.bat while power on stage.



Step5: Run MiniOS7 Utility

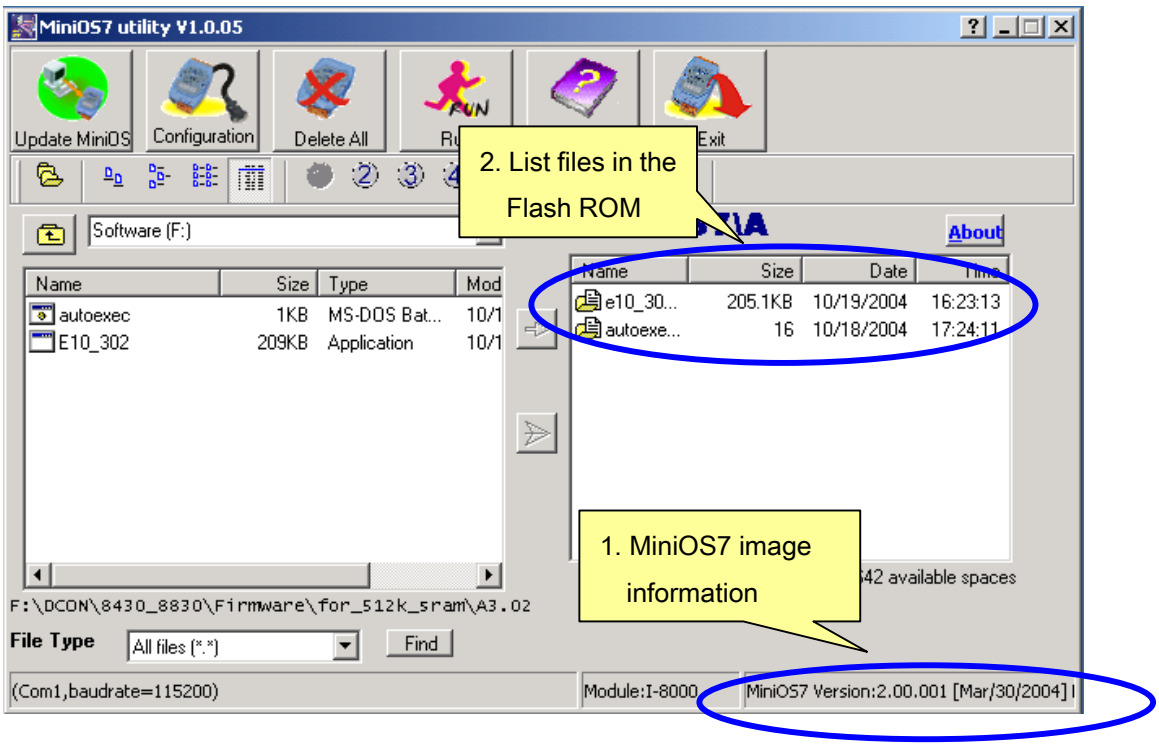


Step6: Select the COM port of the host PC.



After opening the COM port, the MiniOS7 Utility will show informations as below:

1. MiniOS7 image version of the 8430/8830.
2. Files in the Flash ROM



E.2 Updating MiniOS7 image

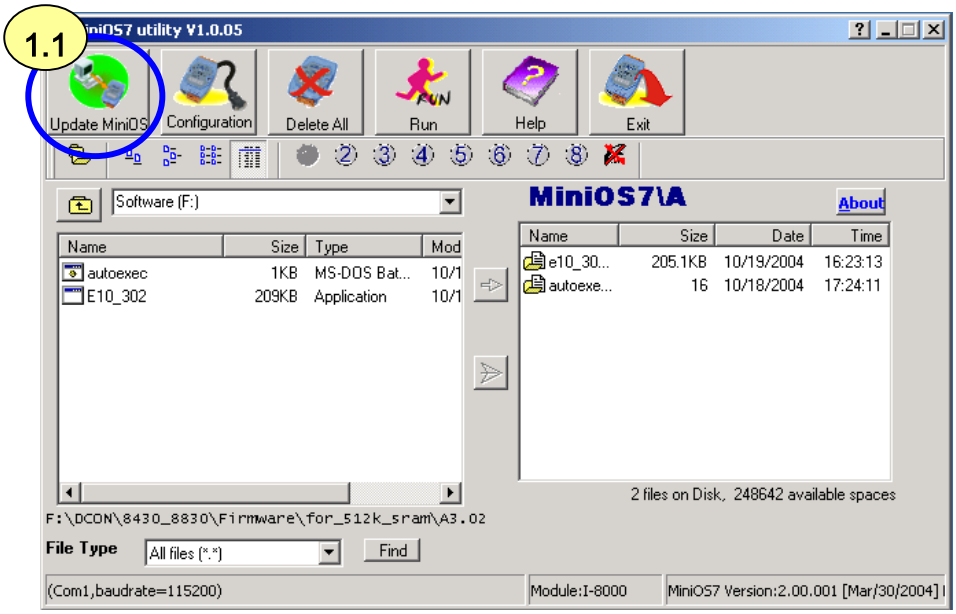
After setup MiniOS7 Utility and initial the 8430/8830. please follow the steps to do the updating MiniOS7 image.

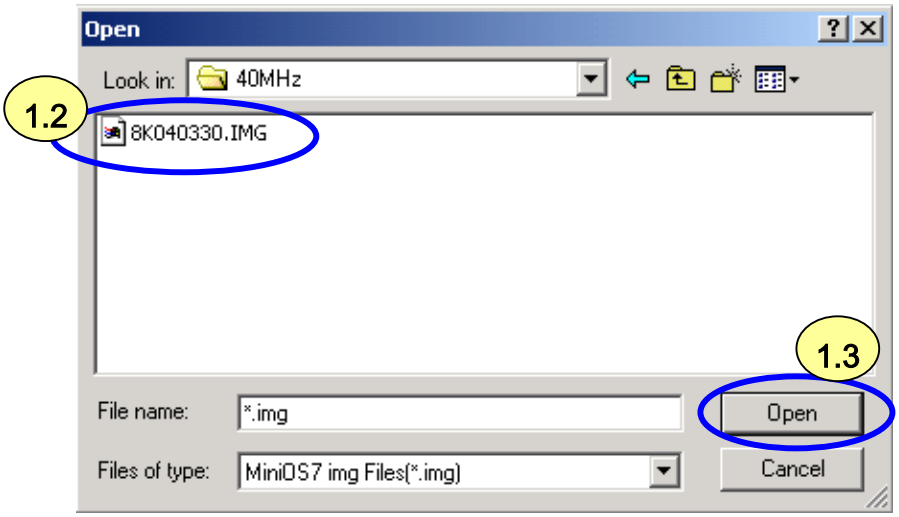
Step1: Click

and select the file to update MiniOS7.

(File : CD:\Napdos\DCON\8430_8830\OS_Image\40MHz\84040330.img)

ftp:/ftp.icpdas.com.tw/pub/8000cd/napdos/DCON/8430_8830/OS_Image/40MHz/84308830.img



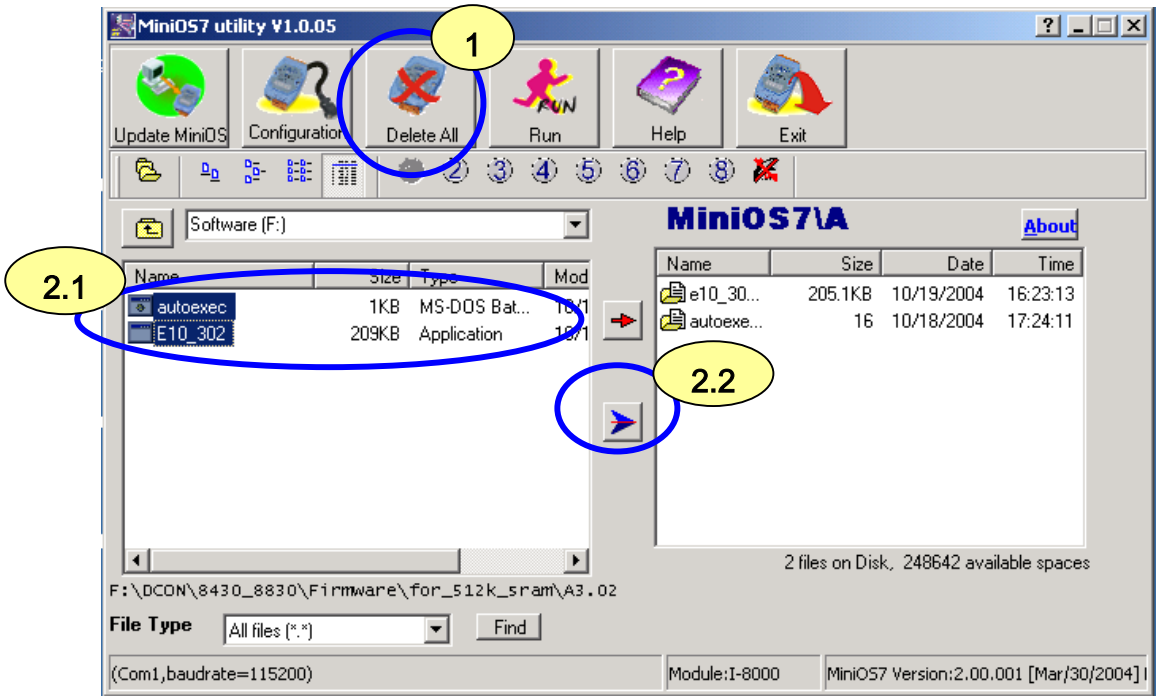


E.3 Download firmware

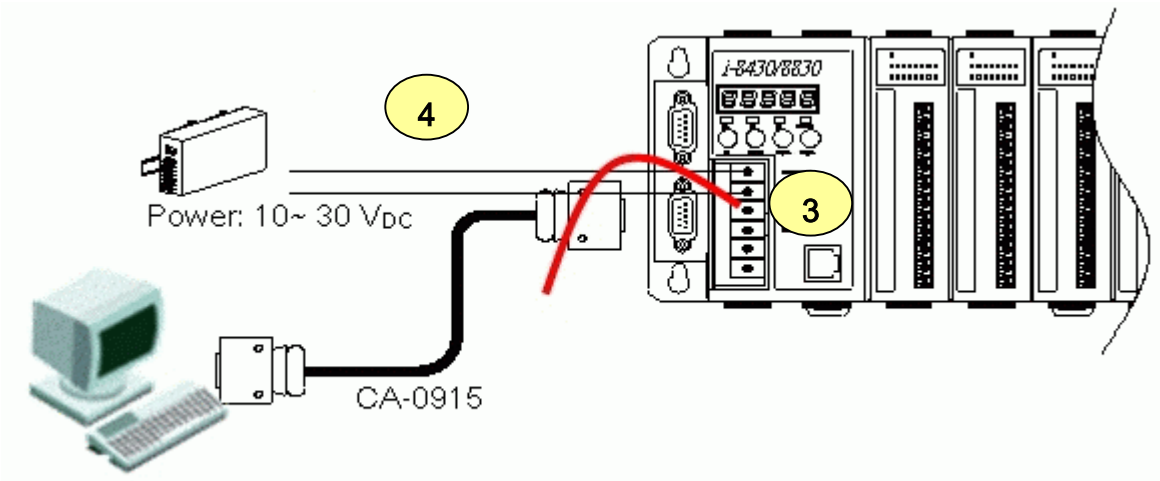
Please follow the steps to download the firmware to the Flash ROM.

Step1: Delete all files in the Flash ROM.

Step2: Select the firmware files and autoexec.bat and click to download the files into the Flash ROM



Step3: Disconnect Init* and Init*COM



Step4: Run the firmware

Method 1: Power off and then power on the 8430/8830. The CPU will run the autoexec.bat in the Flash ROM.

Method 2: Click

to run the firmware.